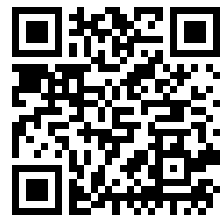

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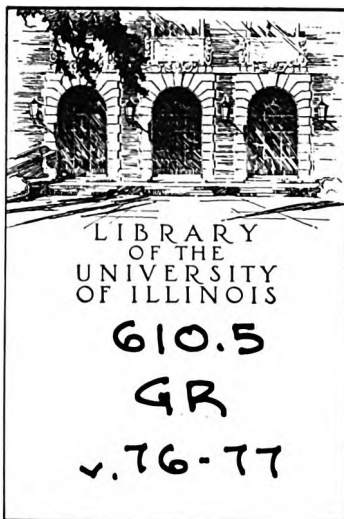
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OF

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MONTHLY

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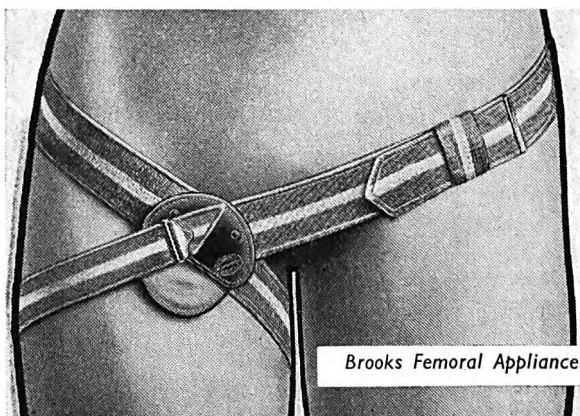
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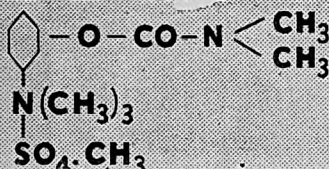
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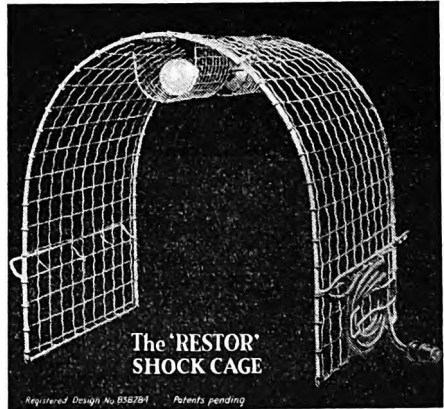
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THE USE OF PLASMA.

BY COLONEL L. E. H. WHITBY, C.V.O., M.C., M.D., F.R.C.P.

From the Army Blood Transfusion Service.

A WOUNDED man who has suffered severe blood loss inevitably exhibits the symptoms and signs of shock and will die from this condition unless the loss is adequately restored. The most serious aspect of secondary shock, progressive circulatory failure, indicated by progressive reduction in blood-pressure, is due not so much to loss of red corpuscles, that is the oxygen-carrying factor of blood, as to loss of blood volume. This renders the circulation inefficient and leads finally to irreparable vascular changes and so to interference with tissue metabolism from which recovery is not possible. Most transfusions of war therefore aim at restoring blood volume, whereas in civil practice transfusions are more commonly performed in order to increase oxygen-carrying power for which purpose fresh whole blood is obviously the fluid of choice. In war the fundamental requirement for the transfused fluid is that it shall remain in the circulation; it must not be rapidly eliminated in the way in which saline and other crystalloid solutions are. A number of fluids other than blood fulfil this requirement and of these human plasma and human blood-serum have many advantages. When a large area of tissue is severely damaged, fluid is also lost from the circulation by plasma exudation into the injured area. This is shown by local tissue swelling and is most prominent in the case of burns, in which condition the plasma loss into burned area may be as much as two or three litres. There may, therefore, be a serious reduction in blood-volume due entirely to plasma loss and this is, indeed, even more serious than

blood loss because the blood becomes viscid by reason of concentration of the red cell elements ; this increases the embarrassment to the circulation. In such cases it is clearly better to restore blood-volume with plasma, the fluid which has been lost, than to do so with whole blood. Successful restoration of blood-volume can only be accomplished by the transfusion of an amount of fluid approximately equal to that lost. It is necessary, therefore, to be prepared to transfuse amounts of from two to six pints, the amount being governed solely by the beneficial effect on the blood-pressure, unless facilities exist for the simple laboratory examinations which allow blood-volume to be calculated (Bushby, Kekwick and Whitby, 1940).

The value of plasma for resuscitation has been amply proved in recent campaigns and in the treatment of air raid casualties. It has been found that restoration of circulatory efficiency automatically increases the efficiency of such red cell elements as remain and so either reduces the amount of whole blood that needs also to be transfused or does away with the necessity altogether. Nevertheless, as a rough rule, it may be stated that, with the exception of burns, with those who require a transfusion of three pints of fluid, one of the pints should be whole blood. At the outset of the war large "banks" of stored blood were established. This blood, if properly cared for, can be kept for three to four weeks ; after this time the corpuscles become so fragile that they are rapidly destroyed in the circulation of the recipient. Experience now shows that blood plasma can be used instead of blood for the primary resuscitation of most casualties. This is not to say that blood has been discarded, for the good clinician will mix blood with plasma in the appropriate case and will, indeed, often use blood alone because it is very much less laborious to collect and prepare.

In order to prepare a pint of plasma, it is necessary to have two and a half pints of blood, which is then subjected to an intricate processing that renders it agglutinin free, fat free and sterile, as described in the article on page 4. But plasma has the advantage that it keeps for at least six months and experience will probably show that this period is very much longer. Nor does it need to be refrigerated accurately and is in fact much better preserved if merely kept cool and in the dark.

The main technical difficulty in the processing of plasma is to prevent post-filtration clotting. The final fluid should properly be gin clear and clot free. But clots themselves do not render the plasma unfit for transfusion though the clot may cause obstruction of the outlet unless the bottle is first shaken in order to aerate the clot and make it float. As a rough clinical rule it may be said that clear plasma is always safe but plasma which is diffusely turbid (as distinct from a definite clot) may be unsafe by reason of infection. Not all turbidity is due to bacterial growth, because fine fibrinous deposits are often diffuse. Nevertheless it is safer not to risk the administration of any bottle which is obviously turbid.

There is often confusion as to the difference between serum and plasma and the two fluids are sometimes wrongly regarded as identical. Serum

differs from plasma in that the former contains no fibrinogen; the more clot that is present in plasma the less fibrinogen does it contain, and the more closely does it approximate to serum.

Army Transfusion Service plasma contains sodium citrate as the anti-coagulant. In a pint bottle there are approximately 400 c.c. of plasma and 140 c.c. of 3 per cent sodium citrate. This last is rapidly excreted by the recipient and in this way is a protection against a transfusion reaction in that the urine is rendered alkaline. The chance of such reactions is extremely small because the plasma has been rendered agglutinin free. It is as well to bear in mind, however, that when a pint bottle is transfused the amount of protein fluid, that is fluid which remains in the circulation, is not a pint, but is no more than 400 c.c. Only the 400 c.c. can be considered capable of restoring blood-volume permanently.

This short description is designed to bring forward certain facts about fluid citrated plasma. It in no way attempts to weigh the merits of fluid plasma as opposed to whole blood, fresh or stored, fluid serum, dried serum or dried plasma, though animal experiments (Buttle, Kekwick and Schweitzer 1940) suggest that of all transfusion fluids alternative to blood, fluid plasma approximates most closely in value to that of blood itself for purposes of resuscitation.

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ARMY BLOOD TRANSFUSION SERVICE TECHNIQUE FOR THE FILTRATION OF BLOOD PLASMA.

BY QUARTERMASTER-SERJEANT S. R. M. BUSHBY

AND

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PRELIMINARY TREATMENT.

For Removal of Fat.—Plasma, having been separated from freshly collected blood and filtered without more than a few hours' delay, is at first crystal clear. But within a few days it becomes opalescent, this being due to the separation of minute globules of fat. This opalescence can be avoided



FIG. 1.—Pooling of A and B blood.

if the blood is kept at a temperature of 4° to 6° C. for one day, and is thereafter warmed to room temperature for six to eight hours before pooling.

For Removal of Agglutinins.—Pooled blood is stood for not less than two hours so that the cells may absorb agglutinins. Blood from A and B donors is pooled into large 2½ gallon bottles with a proportion of B to A of not less than 1 : 16 (fig. 1). Provided the ratio of B to A is not less than this figure most samples contain no agglutinins; a few may contain agglutinins of a titre less than 1 : 8 which is immaterial. The plasma from stored group O blood removed by syphoning may be added to the pool. The lower the concentration of cells in the blood the better will an Alfa-Laval centrifuge (*vide infra*) separate the plasma.

SEPARATION OF PLASMA FROM CELLS BY ALFA-LAVAL CENTRIFUGE.

All parts of the Alfa-Laval centrifuge which come into contact with the blood must be sterilized. The delivery outlet is fitted with rubber tubing so that the plasma can be conducted into sterile bottles without opportunity for aerial contamination. The "yield controlling screw" which is fitted at the plasma outlet must be set so that the interfacial layer of plasma and cells is at the minimum distance from the bottom of the cones; with the screw in this position the blocking of the machine with leucocytes is reduced to a minimum.

If separation is begun by running the blood into the empty spinning centrifuge the first yield of plasma contains much hæmoglobin; this can be avoided by filling the centrifuge first with saline which is afterwards displaced with blood.

If the plasma becomes tinted with hæmoglobin the machine must be taken to pieces, washed with running hot water, re-assembled, filled with saline and the whole process begun again. The Alfa-Laval centrifuge will separate hæmoglobin-free plasma from blood up to forty-eight hours old, but older blood yields plasma tinted with hæmoglobin, presumably from mechanical action upon fragile cells.

CLARIFICATION.

Fat is removed from the plasma by passage through well-packed cotton filters. These are prepared from "Perfecta" pulp which is broken into small pieces and soaked in water in enamel bowls. The soaked pulp is autoclaved at 15 pounds pressure for thirty minutes; this process not only sterilizes but helps to make the texture of the pulp homogenous. The filters are prepared in bottomless Winchester quart bottles, the necks of which are filled with large pebbles (fig. 2); they are sterilized by steaming. Before use the filter is washed through with sterile saline.

The plasma is clarified by suction through these filters into sterile bottles. Each filter will deal with approximately 6 litres after which it becomes saturated. On standing the plasma may become opalescent

from incomplete separation of the fat during the pre-clarification stages ; this opalescence is removed by the sterilizing filtration process (*vide infra*).

STERILIZATION.

This is accomplished by passage through asbestos pads in a Seitz pilot filter.

Asbestos pads possess the property of adsorbing the fibrinogen from the



FIG. 2.—Clarification through cotton-pulp filter.

first portion of filtered plasma. When using eight 20 cm. pads the first 500 c.c. of filtrate contains no fibrinogen whilst the next 1,000 c.c. has a very poor content.

The asbestos also removes prothrombin from approximately 10 litres, the amount varying slightly with the batch. Although this 10 litres of filtered plasma contains neither prothrombin nor ionizable calcium most

of it subsequently clots on storage. The rate of clotting is the reverse of the order of filtration. Thus clotting begins in the last bottles within twenty-four hours, but may not occur in the earlier ones for fourteen days or longer or even not at all. If sufficient plasma is passed through the pads (about 15 litres) clotting occurs instantaneously even in the filter. The delayed clotting in filtered plasma occurs more rapidly at 4° to 6° C. than at room temperature.

Clotting in the later batches of filtered plasma is probably due to traces of thrombin, formed on the filtering pad from the activation of adsorbed prothrombin by a metallic ion, probably magnesium, which is able to function in the same way as calcium, and which is known to be present in asbestos in considerable amount.

The prothrombin adsorbed on to the asbestos pad can be removed from the pads by alkali. If, therefore, the pads are washed with N/30 sodium hydroxide at the stage immediately before thrombin begins to appear in the plasma, the delayed clotting of filtered plasma can be prevented.

This is the principle followed in the detailed technique described below.

STERILIZATION AND ASSEMBLY OF APPARATUS.

(The letters in the text refer to fig. 3.)

Filter.—The Seitz pilot filter is sterilized by steam under pressure. The outlet cock (O), to which is attached a piece of rubber tubing 2 feet long (D), is wrapped in calico and sterilized separately in the autoclave. After sterilization it is connected to the unsterilized filter with the valve closed. Steam is passed into the filter until it escapes freely from all opened valves, whereupon all are closed except the two draining valves and these are so adjusted that any condensed steam can slowly escape. The pressure is allowed to rise to 5 pounds per square inch and is maintained for ten minutes. The outlet valve is then opened and steam is allowed slowly to escape from the attached tubing, the end of which has already been covered with calico. The inlet valve is adjusted so that the pressure is maintained at 5 pounds per square inch for a further ten minutes, after which time the steam is turned off, the outlet valve closed and the apparatus allowed to cool.

Pooling and Bottling Apparatus.—For convenience the distributing apparatus is sterilized separately in the autoclave. This apparatus consists of a 4-litre reservoir bottle (C) with a wired-in rubber bung through which is passed two $\frac{1}{4}$ -inch glass tubes. One of these glass tubes reaches to the bottom of the bottle, the other is a short length. The short length is attached to a piece of rubber tubing that leads to an efficient wool filter (W). The long length terminates as a T piece, one arm of which is connected by rubber tubing to two $\frac{1}{4}$ -inch glass tubing delivery pipettes (E and E₁), protected by hoods (F and F₁) made from bottomless Winchester quart bottles. Before use the sterility of these hoods is maintained by large plugs of wool covered with calico held in position by rubber bands.

The other arm of the T piece connects by rubber tubing to a second T piece (G); this is joined to two more T pieces (H and K), and so forms a triangle. One open end of this triangle is connected by rubber tubing

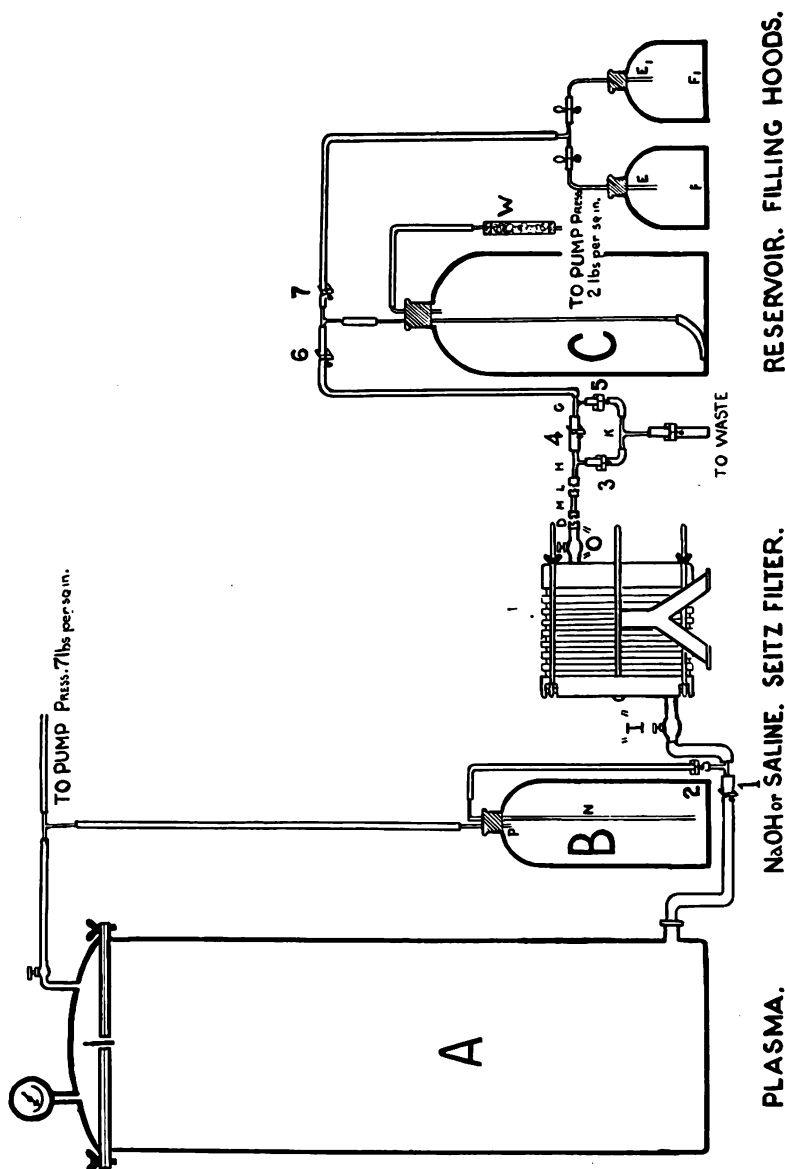


FIG. 3.—Diagrammatic plan of filtration and bottling system. For explanation of letters see text.

to a terminal of short glass tubing (to waste); the other, by means of rubber tubing (L) and a glass connection (M), joins the distributing apparatus to the filtering system. All open ends are protected by calico and wool.

When assembling, the distributing apparatus is joined to the filter by inserting the open glass end (M) into the rubber tubing (D) on the outlet valve with all aseptic precautions. As a final precaution the union is immersed in boiling water for fifteen minutes. Five screw clamps are fitted in the positions 3, 4, 5, 6, 7, as illustrated.

Positive Pressure Vessel and Alkali or Saline Reservoir.—The plasma is contained in a tin-lined copper pressure chamber (A), which connects by rubber tubing to the inlet valve (I) of the filter. None of the apparatus to the left of the filter (*see fig. 3*) is subjected to full systematic sterilization, but is kept scrupulously clean and is assembled after thorough rinsing with hot water. Sterilization of this part of the apparatus is unnecessary because all the plasma therefrom is subjected to filtration. Immediately in front of the filter inlet valve (I) a T piece is inserted. This provides the inlet for the alkali and the saline wherewith the filter pads are washed between successive filtrations; it connects by rubber tubing to a long piece of glass tube (N) that passes through a two holed rubber bung into a Winchester quart bottle (B). A short piece of glass tubing (P) passes through the other hole of the bung and connects to the pump. Two screw clamps are fitted in the positions 1 and 2 as illustrated.

Blood Transfusion Bottles.—Pint blood transfusion bottles in which the filtered plasma is collected are plugged with wool covered with gauze and the plug as well as the neck of the bottle are then covered with cellophane in order to prevent dust settling on the rim. These are autoclaved. These bottles are finally sealed with rubber bungs which undergo boiling in a water bath at the time of filtration; this water bath contains distilled water with 1 per cent phenol. The bungs are kept covered with the boiling solution and any loss of fluid due to evaporation must be replaced with the phenol solution. The phenol ensures that the potential space between the rubber bung and the neck of the bottle is filled with a film of antiseptic which lessens the risk of bacteria or fungi growing downwards into the plasma.

TECHNIQUE.

Premises and Staff.—The filtration and bottling of plasma is carried out in a draught- and dust-free room. The floor of the room is kept moist with antiseptic during the whole time it is in use. The atmosphere should be sprayed with a suitable aerial disinfectant such as Euginol Carbinol.

A staff of four is required; all must wear sterile gowns and masks and sterilize their hands with Dettol. Changing of clothes, coats for gowns, etc., within the room is forbidden.

Operator No. 1 takes charge of the plasma container and is responsible for changing bottles of saline and caustic soda and for washing the filter pads between-whiles. Operators Nos. 2 and 3 are responsible for bottling; Operator No. 4 is responsible for placing the bungs in the bottles (*fig. 4*).

Filtration—First Batch.—The copper container (A) is filled with plasma and, with screw clamps Nos. 2, 3, 5, and 7 closed, Operator No. 1 applies a pressure of 7 pounds per square inch to the container thereby forcing the plasma through the filter into the reservoir bottle (C). For this first batch, 3 pints only are allowed to run into the reservoir, whereupon clamp No. 1 is closed and clamp No. 2 opened, pressure now being applied through the saline and alkali container (B), which at this stage must be empty. By applying pressure in this manner the residue of plasma in the filter is forced into the reservoir bottle; and pressure is maintained until air begins to appear from the filter. The reservoir now contains 4 pints, which is the largest amount of plasma that can be filtered during this first stage without subsequent clotting.

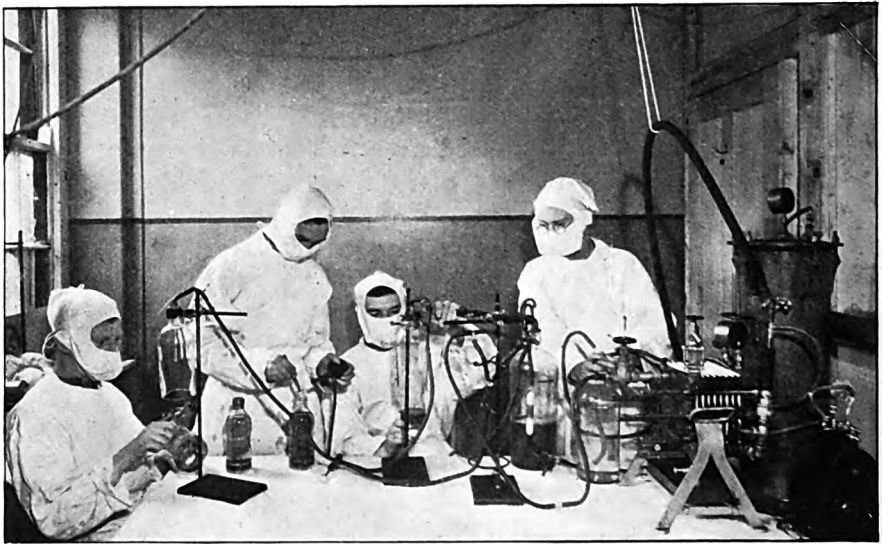


FIG. 4.—Filtration and bottling team at work.

Bottling.—Clamps Nos. 4 and 6 are closed whilst No. 7 is opened so that the plasma can now be distributed into bottles. Operators Nos. 3 and 4 each work a hooded pipette and each pipette is used alternately. A pressure of 2 pounds per square inch is applied to the reservoir to force the plasma into the pipette. A bottle is placed very carefully under a hood and when removing the plugs care is taken not to touch the rim of the bottle with the fingers; nor must any plasma be allowed to foul the neck of the bottle during the filling process. The flow is controlled by spring clips and filling is so timed that one of the clips is always open. As each bottle is filled it is taken by Operator No. 4 who carefully avoids slopping the plasma on to the neck of the bottle and who keeps the mouth of the bottle covered with a Bunsen flame from the time it leaves the hood until the bung is pushed into position. Bungs are removed with forceps from the boiling water bath

containing 1 per cent phenol in distilled water which has previously been described. The top of the bung and the neck of the bottle are swabbed with a watery solution containing 10 per cent glycerine and 2 per cent phenol. The top of the bottle is then covered with a viscap which has previously been soaked for one hour in a watery solution of 1 per cent phenol and 2 per cent glycerine.

Washing the Filter with Alkali.—Whilst the filtered plasma is being distributed the filter is being washed with alkali and afterwards cleared with saline before continuing filtration. Clamp No. 3 is opened and 2 litres of N/30 caustic soda, contained in one Winchester bottle (B), are forced through the filter and allowed to run to waste. The Winchester of alkali is then changed for a Winchester of normal saline which passes through the filter and so displaces the alkali. Another Winchester of saline is then connected and after a total of 3 litres has passed, clamps Nos. 4 and 5 are opened thus washing away any alkali which has collected in front of clamp No. 4. The 4 litres of saline are followed by plasma by closing clamp No. 2 and opening No. 1, but the filtrate continues to run to waste until plasma appears. Clamp No. 6 is then opened whilst clamps Nos. 3, 5 and 7 are closed.

Filtration—Subsequent Batches.—Eight pints of plasma may now be filtered before the filter is again washed. It is important to shake the reservoir periodically in order to ensure that the plasma is homogeneous. At least 150 pints of plasma can be filtered through the eight plates of the filter, but washing must be carried out after every eighth pint.

Sterility Tests.—Sterility tests should be made by running 20 c.c. of plasma into 100 c.c. of 1 per cent glucose broth contained in a pint blood transfusion bottle. Six tests should be made during the filtration of 150 pints. The cultures should be incubated for three days. This medium will grow both aerobes and anaerobes.

The plasma should be stored in a warm room for at least seven days before being used. This serves as an incubation period for any casual contaminant, the growth of which will become visible to the naked eye. The detection of bacteria by this macroscopic method is not easy, but plasma which remains crystal clear can safely be assumed to be sterile. Sterile plasma can become opalescent from minute droplets of fat which have not been removed in the early cooling and warming process; this opalescence can simulate the growth of organisms such as *B. subtilis*. Fibrin occasionally forms as granules and this closely resembles the growths of staphylococcus, streptococcus and diphtheroid bacilli. Most of these pseudo-growths can be recognized with practice, but where there is any doubt it is better to make microscopic examinations of the suspected samples, rejecting the contaminated ones and refiltering the others.

Yield.—The plasma yield by this process is a little under 50 per cent of the original blood volume when 100 c.c. of anti-coagulant is added to 440 c.c. of blood. The theoretical yield is 60 per cent.

Four workers take about four hours to filter and bottle 150 pints.

GUNSHOT WOUNDS OF THE HEAD IN 1940.

By HUGH CAIRNS.¹*Temporary Colonel, Army Medical Service.**(Nuffield Professor of Surgery, University of Oxford.)*

IN a recent series of gunshot wounds of the head certain points emerged which call for comment at the present time. The classification followed is that of Cushing (1918), but with the small number of cases involved it has not been necessary to use all of Cushing's types. In addition, the cases have been subdivided into two main groups: non-penetrating or penetrating, depending on the integrity or otherwise of the dura mater. In gunshot wounds of the head the condition of the dura is the most important item of information required by those responsible for treatment and assessment of the amount of disability. If the dura is penetrated the liability to intracranial infection is greatly increased and the risk of subsequent epilepsy is probably also enhanced.

TABLE I.—GUNSHOT WOUNDS OF THE HEAD.

Variety				No. of Cases	Complications	No. of Cases
NON-PENETRATING						
Scalp wound	..	..	..	9	Local osteomyelitis	1
					Local osteomyelitis and subdural abscess	1
					Local osteomyelitis and brain abscess	1*
Local fracture with intact dura	..			6	Local osteomyelitis	1
					Abscess around F.B. in scalp	1
PENETRATING						
Depressed fracture with dural tear	..			1	Subdural hæmatoma and brain fungus	1
Penetration of brain with fragments of bone	..	..	..	6	Brain ærocele and fungus	1
					Brain fungus	2
					Purulent leptomenigitis	1*
Penetration of brain with fragments of bone and metal	..	..	..	6	Brain ærocele and fungus	1
					Purulent leptomenigitis	1*
Cranio-cerebro-orbital	..			1	Brain fungus and abscess	1
Total				29		

* Deaths.

THE EFFECT OF GUNSHOT WOUNDS ON CONSCIOUSNESS.

This series of cases shows some striking differences from the closed head injuries of civil life. The first of these is the frequency with which consciousness is retained at the moment of impact. Seventeen of the twenty-

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nine patients did not lose consciousness at the time of injury; they remembered and could describe its effects. The usual story was that the patient was knocked over by the impact and then got to his feet, to continue fighting, or to walk back to the aid post. Some of these patients lost consciousness fairly soon after injury, e.g. after walking 150 yards, or at a later stage, especially if given morphia in dosage of $\frac{1}{4}$ to $\frac{1}{2}$ grain; but the typical unconsciousness of concussion, as seen in civil cases, was absent. In a further 6 cases unconsciousness did occur, but was only momentary. Thus, 23 of 29 patients did not have the clinical syndrome of concussion.

The absence of concussion is not to be explained by the high incidence of non-penetrating wounds. The cases without initial loss of consciousness include 3 penetrating frontal lobe injuries; and 5 of the 6 cases with only fleeting loss of consciousness were cases of penetrating injury (2 frontal, 2 occipital, and 1 temporal). Moreover, in the majority of the scalp wounds there is distinct evidence of brain damage, as illustrated by the following case:—

Case 1.—Guardsmen J. D. (Serial No. 46) received a scalp wound in the right parietal region, and immediately his left arm and hand became numb and useless. He did not lose consciousness, and his leg was not affected. During the next week his upper limb gradually recovered, though he often dropped things from his hand. Then the wound suppurated and he developed a right parietal subdural abscess, with return of brachial monoplegia and later considerable motor and sensory weakness of the left leg. The subdural abscess was opened and drained twenty-nine days after injury. The patient recovered and returned to duty four months after his injury.

In many scalp wounds the evidence for brain damage is in the focal signs such as those described above. In cases of scalp wound in which there are no focal signs there may still be intracranial damage, as in the following case:—

Case 2.—B. McN., a civilian, aged 25 (R.I. No. 9709), received a long scalp wound of the vertex from bullet or bomb fragment. He did not lose consciousness, but suffered from frontal headache of gradually increasing intensity. Four hours after injury there were no neurological signs except diminished tendon jerks, but lumbar puncture showed slightly but uniformly blood-stained fluid under an initial pressure of 200 mm. water. Thirteen days after the injury the cerebrospinal fluid was normal (initial pressure 100 mm.). The patient made a complete recovery.

In spite of the absence of concussion effect, consciousness may frequently be lost at a later stage, from a variety of causes. The assessment of delayed unconsciousness may be difficult, and it is important to recognize that extreme fatigue may play a considerable part in producing it, especially when combined with routine injections of morphia.

Of the six patients with a story of prolonged unconsciousness after injury (duration between eight hours and several days), one was an unreliable witness, another was probably hit by falling masonry as well as by a missile, and a third was dysphasic and his field card notes were incomplete. The remaining cases were as follows:—

Case 3.—Pte. H. R. (Serial No. 226). Gunshot wound of left external auditory meatus. A fragment of metal penetrated and lodged in the vermis of the cerebellum. His last memory was of carrying a message for his platoon commander, until he awoke in hospital in England. He was unconscious for several days.

Case 4.—Pte. D. G. D. (Serial No. 34). Tangential wound of right temple, the missile shattering the right side of the frontal bone and right orbit, with exposure of a large area of the right frontal lobe. The patient was unconscious for five days.

Case 5.—Pte. A. D. (Serial No. 49). Left parieto-occipital gunshot wound, with indriven bone fragments. Blood in the left middle ear (with temporary deafness on recovery of consciousness). This patient was unconscious for twelve hours after the injury and had further lapses of consciousness during the next few days.

It is difficult to draw conclusions from such a small and to some extent selected group of cases, especially in the absence of accurate notes on the state of consciousness during the first few days after injury. But it is remarkable that cases of foreign body penetrating the frontal and parietal lobes showed no loss of consciousness, whereas a foreign body passing through the petrous bone into the cerebellum (Case 3) produced unconsciousness which lasted several days. Is the unconsciousness (concussion) of closed head injuries of civil life due to commotion of the whole brain, or to damage to some part of it, such as the brain stem? A carefully documented study of the state of consciousness after penetrating gunshot wounds may throw some light on this problem. The case notes should record the degree and duration of the unconsciousness from the earliest possible moment after injury. Does the patient respond to questions in a normal or drowsy manner? Or does he only respond to loud shouts, or to painful stimuli?

FOCAL SYMPTOMS.

Another respect in which gunshot wounds differ from closed head injuries is in the frequency with which they are followed by symptoms of a focal character. The following cases illustrate this point.

Case 6.—Sergeant J. H. (Serial No. 157) was struck in the right occipital region by a shell fragment. The bone was fractured and fragments of it penetrated the right occipital lobe. He does not recall the noise of the shell-burst, but remembers feeling himself moving, and he was thrown two and a half yards by the explosion. He saw a moving mass of red and black colours. For a few seconds after striking the ground he was unable to move. He rapidly regained movement, first of his right arm and then of his whole body, and he was able to speak and get up. He found that he was completely blind and he had to be led back to the command post seventy yards away. Here he was able to make out the light of a paraffin lamp, but nothing more. By the time he had reached the Field Ambulance one hour later he was still unable to distinguish more than light or dark. On the following day he was operated on; the skin wound was excised and sutured, after presenting bone fragments and pulped brain had been removed.

On the second day after injury some sight returned in his right upper visual fields. On the fourth day after injury he could make out faces and other objects to his right side, but these were still blurred. On the tenth day he could read printed words on his field card and could see clearly in his right fields and not at

all in his left fields. During the next eight weeks there was gradual improvement of the left upper visual fields and his ability to read became almost normal.

When seen by us about ten weeks after the injury he had a steep-edged congruous left lower quadrantic homonymous hemianopia, and his visual acuity was 6/5 in each eye. There were no other neurological signs. X-rays showed fragments of bone in the right occipital lobe.

After the injury this patient had deafness, tinnitus, and some discharge from the right ear which gradually passed off completely.

This case illustrates the well-known fact that focal damage to the brain after gunshot wound is by no means solely due to the penetrating foreign body. Bone fragments entered the right occipital lobe, breaking up the upper half of the right geniculo-calcarine pathway with a resultant left lower quadrantic hemianopia of permanent character. The initial symptoms, however, were those of complete blindness. During the following days vision recovered in an orderly manner: first in the right upper fields, then in the right lower fields, and finally, after some weeks, in the left upper fields. The permanent damage was of very limited extent and corresponded to the track of the foreign body. The temporary damage affected a wider, but, if we may judge from the clinical evidence, fairly sharply defined zone; and the severity of this completely reversible process varied inversely with the distance from the site of injury.

The focal damage that can be produced without penetration of the brain is illustrated by the following case:—

Case 7.—Guardsmen A. C. (Serial No. 78) was struck by a bullet which made a large hole in the back of his steel helmet and produced a scalp wound and fissured fracture in the left occipital region, without any depression or penetration. He did not lose consciousness, but his sight became misty. He was able to walk back unaided about one mile, but his sight then failed so that he could only perceive light. Thereafter his sight gradually recovered, but he could not read small print until three weeks after the injury. Two months after the injury his fields and acuity were normal and he showed no neurological signs.

Cases of this type were reported during the 1914-18 war by Hine (1918), who was able to trace the recovery from homonymous hemianopia by day-to-day perimetry. It is interesting to note that in Case 7 the focal damage was gradual in onset, and this has been observed in other cases. It suggests that the cause is cerebral or meningeal hæmorrhage of limited extent. Examples of focal damage are seen affecting parts of the brain other than the occipital region.

Case 8.—Lt. G. H. M. (R.I. No. 9311) was hit by a shell fragment which pierced his steel helmet in the right Rolandic region and fractured the bone without penetrating the dura. He was not unconscious and continued fighting for some time, although his face was paralysed on the left side and he was grossly dysarthric. Three days after injury the missile was removed from the skull. Two months later the wound was reopened on account of persistent discharge, and five loose fragments of bone, most of them dead, were removed from between skull and dura. The left facial paralysis cleared up almost completely in the first three weeks, but traces of it were still distinctly visible four months after the injury.

The brain damage associated with scalp wounds was described by

Jefferson (1919) in an important paper at the end of the last war. Among 54 cases of scalp wound treated by him there were seventeen which showed signs of local contusion. "In the Rolandic region," he writes, "such signs can be traced through all grades of severity, from a local increase of the tendon jerks . . . up through slight aphasias, numbnesses, and pareses, finally culminating in definite palsies and Jacksonian fits." He points out that while it is easy to recognize the signs of contusion of the Rolandic and occipital regions it is extremely difficult to recognize contusion of silent areas. In some cases of focal brain injury an extradural or subdural clot is found, but in others inspection of the dura at operation has shown no evidence of abnormality, and it is probable that the primary pathological lesion is a bruising of a limited area of cortex and meninges below the site of the injury.

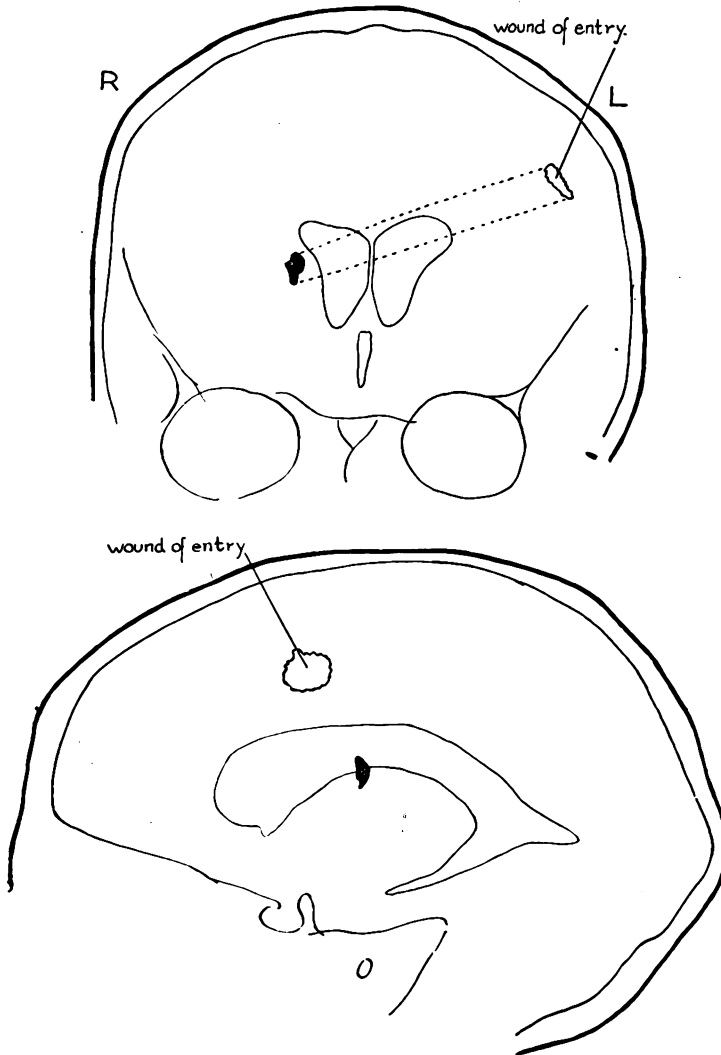
In the cases of this series there has been only one showing evidence of *contre-coup* damage, but Jefferson had four cases in which there was increase of tendon reflexes on the side of the scalp wound. In penetrating wounds, Dupérié (1916) reported homolateral signs, such as Jacksonian epilepsy and hemiplegia, and in necropsies he found *contre-coup* damage in 17 of 100 cases. This type of damage appears to be more common in the severe cases; of Dupérié's sixteen patients showing homolateral signs, seven died. In the one case of our series a patient with a deeply penetrating bomb wound of the left frontal lobe and right hemiplegia also had complete paralysis of the left lower limb. At operation the sagittal sinus was patent and there was no evidence of fracture, or of extradural or subdural hæmorrhage over the right hemisphere.

SPONTANEOUS RECOVERY FROM FOCAL SYMPTOMS.

It appears that after gunshot wound there is a strong tendency for the focal signs to undergo spontaneous improvement or recovery. This applies to penetrating brain wounds as well as to wounds of the scalp and skull. The tendency may be more evident in this war than in earlier ones, owing to the relatively greater incidence of small metal fragments of high velocity.

Case 9.—Penetrating bifrontal wound with retained metal foreign body. Severe aphasia. Spontaneous recovery.—A. A. S., a civilian, aged 32 (Serial No. 69), was wounded by a bomb which landed about thirty feet from him. He received multiple superficial wounds, and one metal fragment, in size slightly less than 10 by 3 by 5 mm., penetrated the left side of the frontal bone and lodged in the right hemisphere (fig. 1). Subsequent encephalograms showed that its track through the brain crossed the lateral ventricle and the corpus callosum. A reliable observer states that after being hit the patient was still standing, hanging on to a support. He was able to walk with assistance; he was unable to speak, but made signs to indicate his wants. In the left frontal region there was a wound from which blood and brain tissue were protruding, and there was another superficial wound in the left parieto-occipital region. Five hours after injury the scalp wounds were excised, and blood-clot and bone fragments were removed from the superficial part of the penetrating frontal wound, but no attempt was made to remove the foreign body. The patient was given antitetanic serum and a course of sulphonamides.

When first seen by us about forty-eight hours after the injury the patient looked ill. Temperature 99.6° F., pulse-rate 106. He was conscious and understood simple commands, but motor speech was limited to a few single words, such as his surname. There was a leak of cerebrospinal fluid from the penetrating left frontal wound. He had considerable neck stiffness. There was slight weakness



FIGS. 1A and 1B, Case 9.—Transventricular penetrating G.S.W. with retained missile.

of the right side of the face, coarse tremor of both hands, more so on the right side, and slight weakness of toe movements on the right side. The abdominal reflexes were absent, both plantar reflexes were extensor in type, and he had retention of urine. As far as could be tested, sensory function was intact. Lumbar puncture yielded blood-stained fluid under an initial pressure of 190 mm.; total

protein 240 mgm. per cent ; red cells 27,800, white cells 520 per c.mm. ; polymorphonuclears 69 per cent, lymphocytes 31 per cent ; on culture a few colonies of *Staphylococcus albus*. X-rays showed a foreign body deep in the right frontal lobe (fig. 1).

The outlook in this case at first appeared grave, but within three days the improvement in speech, the cessation of the cerebrospinal leak from the wound and the diminution of the white cell count in the cerebrospinal fluid showed that our initial fears of fulminating meningitis were groundless. On the fourth day after injury voluntary control of micturition returned. By the fifth day he could read simple sentences slowly, and could understand simple commands, though his performance was inhibited very easily. He named most objects correctly but slowly. There was profound disturbance in writing and in calculation. Spontaneous speech was absent. There was also a notable absence of spontaneous and semi-automatic movements. He was confused as to time and place. For the first two weeks after the injury he could not recall any events since going to work on the morning of the injury.

Recovery progressed gradually and by four weeks after the injury he had recovered spontaneity in speech and action and had regained his mental faculties and confidence sufficiently to mix freely with the other patients. There was still difficulty in calculating and in reproducing what he had read. Spelling mistakes were frequent, especially in writing words out of context. Three and a half months after the injury there was further recovery, but he was still slow in calculating and still showed complete lack of understanding of mathematical symbols. He was, however, able to do light work in his garden.

In this case a small fragment entered the left frontal lobe just in front of the precentral gyrus, traversed both lateral ventricles, and lodged deep in the right hemisphere. There was at first a profound aphasia and also a leakage of cerebrospinal fluid from the wound. During the next four weeks there was a rapid and steady recovery of speech. Excision of the foreign body was out of the question owing to its depth, and the degree of spontaneous improvement was greater than had been expected.

Spontaneous recovery from hemianopia after penetration of the occipital lobe has already been noted in Case 6. In Cases 6 and 9 the residual functional damage was so slight that it could not have been bettered, and might easily have been aggravated, by early operation on the brain itself.

In the last war complete excision of the foreign body and its track of damaged brain was advocated and practised by experts on the following grounds :—

- (1) To remove infective material which might otherwise produce meningitis or brain abscess, and dead brain tissue which would act as a favourable nidus for infection.

- (2) To remove massive clot, extradural, subdural, or intracerebral, which might otherwise be fatal or produce further local brain damage.

- (3) To diminish the liability to epilepsy occasioned by a retained foreign body.

The third point still remains to be proved, and in any case it does not necessarily bear on the question of early operation, for experience may show that, if foreign bodies are to be excised with the idea of diminishing the

liability to epilepsy, the best time for doing so is some weeks or months after the injury, when the wound of entry has healed.

The indications to remove clot and septic material remain valid, but it is clear that in a number of cases of this war, infection and massive clot do not develop; the changed conditions of warfare, chemotherapy, and, possibly, a relative decrease in size of high velocity missiles may contribute to this. Another indication also comes more clearly into the picture from recent experience, and that is that operations on brain wounds should not interfere with the spontaneous recovery of brain function that tends to occur in the days following injury. To judge from the literature of the last war, functional recovery after operation was often ascribed to operation. Our experience is sufficient to show that operation cannot cure focal signs which are the immediate sequel of penetrating wounds. The presence of such signs is not an indication for operation. It is only the signs of delayed onset and progressive course, due to clot, infection, or *ærocele*, which may be amenable to surgery.

Our experience of this war is so far small, particularly in regard to the more severe cases that tend to die in the first few days after being wounded, and no hard and fast rules for the treatment of penetrating brain wounds can yet be made. There is a suggestion, however, that a conservative policy may often be of value, particularly when the penetrating body is small; and there is an absolutely clear indication for the most careful observation of the development and course of the neurological signs in the first hours and days after the injury, together with thorough bacteriological studies of the wound.

Meanwhile the case for early operation to clean surgically the skin and superficial parts of every head wound, and where possible to do primary suture, remains clear. The sooner the wound is thoroughly cleaned of hair, dirt, bone splinters, and other foreign bodies down to the dural level, the less the risk of subsequent complications. Within the brain every manipulation potentially increases the brain damage and diminishes the extent of functional recovery, and therefore the utmost caution and gentleness must be exercised.

THE TREATMENT OF SCALP WOUNDS.

The experiences of this series show the extreme importance of surgical treatment of scalp wounds in the early stages. There were 15 cases of non-penetrating injury in 9 of which the laceration was confined to the scalp, while in the remaining 6 the skull also showed a small, usually linear, fracture. In 5 of these superficial wounds complications occurred, owing to inadequate treatment of the wound in the early stages; one patient died and another almost died from these complications (Table I).

This last case has already been mentioned (Case 1). The patient had a subdural abscess following a right parietal scalp wound, without fracture of the skull and without loss of consciousness. The wound was never excised. The notes state that on the day following injury the wound was "dirty, but showed no signs

of gross infection. Hypertonic saline dressings." Seven days after injury the wound was purulent and oedematous, and discharged pus containing a heavy growth of hæmolytic streptococcus; there was fever and malaise; sulphonamide treatment was now begun. Two weeks later the patient developed left hemiparesis, together with signs of meningitis (turbid cerebrospinal fluid which was sterile on culture). On admission to this hospital he was semicomatose, and showed early papilloedema, severe motor and sensory loss of the left arm, and, to a less extent, of the left leg. The cerebrospinal fluid contained 273 white cells per c.mm. At operation (Major P. B. Ascroft) beneath the granulating scalp wound a subdural abscess was found. It contained about 15 c.c. of pus from which streptococci were grown. After operation recovery was not absolutely complete, some slight sensory disability persisting in the left hand.

If, when this man reached hospital twenty-four hours after injury, his scalp wound had been excised, dusted with sulphonamides, and sutured, there is little doubt that the subdural abscess would not have developed.

The fatal case of scalp wound was as follows.

Case 10.—Pte. H. W. (Serial No. 58) was wounded in the right occipital region by a shell fragment on June 1, 1940. His helmet was impacted in his scalp and a scale of metal, 1 cm. in diameter, was embedded in the outer table of the skull, but there was no radiating fracture. He was not unconscious. The wound was excised and sutured on June 3. On June 8 he had an epileptic fit, and next day, for the first time, severe headaches, followed by progressive drowsiness. On admission to this hospital on June 11, there was an indolent scalp wound in the right occipital region. The patient was drowsy and showed complete left homonymous hemianopia and slight neck rigidity. The lumbar cerebrospinal fluid showed 3,200 white cells per c.mm. Sulphonamides were started. On June 14, the wound was opened and an extradural abscess was drained (pus contained *Staph. aureus* and streptococcus). The wound was excised and was dusted with pron-tosil powder. The patient improved for a time and his wound became cleaner, but after some days he became progressively more drowsy. On June 24, a right occipital abscess was drained through the old wound. Progress was not satisfactory and further loculi of pus were drained on July 6 and 9. The patient died on July 10. At post-mortem there was a collapsed abscess cavity and intense oedema of the white matter of the whole hemisphere.

That the excision of the wound on the second day after injury was rather perfunctory is shown by the fact that, at the second operation on June 14, a large flake of metal was found in the depths of the wound, embedded in the outer table of the skull. Even two weeks after injury, dusting of the wound with sulphonamides seemed to improve its condition, but this had no influence on the course of the patient's illness, for by that time he had an extensive cerebral abscess.

These cases suggest that in scalp wounds the risk of infection spreading through the intact skull and dura is greater after gunshot wound than after blunt injury. The high incidence of focal signs in gunshot wounds of the scalp indicates that the underlying zone of brain tissue is severely damaged, much more so than in scalp wounds due to blunt injury, and the resistance of this part of the brain to bacterial infection is correspondingly reduced. The skull at the site of impact is probably similarly affected, even though it may not be fractured.

In the other three cases the complications of scalp wounds were mild : in two there was local osteomyelitis, with persistent discharge from the wound until sequestra were removed ; in the third an abscess formed about two fragments of bomb-casing in the scalp. The frequency with which bone and brain became infected after gunshot wounds of the scalp and skull in this series indicates clearly the importance of careful operative treatment of what are apt to be regarded as trivial wounds. From the point of view of conserving man-power, the operation of cleaning and closing a scalp wound is much more important than the operation of removing a foreign body from the brain.

This simple operation is badly done by many surgeons. The most common mistake is to regard the operation as a minor one which may be performed in an aid-post or in a casualty room. The skin around the wound is shaved in a perfunctory manner and over a small area. If manipulation of the wound is painful, as when no anæsthetic is given, it is inevitable that the wound is not thoroughly explored and that it is cleaned and excised imperfectly.

Many surgeons still adhere to the method of closing the scalp by a single layer of widely spaced and tight sutures. By this procedure the blood supply of the wound edges is impaired and the sutures, which must be retained for several days, tend to cut through the skin. The result is an unsightly scar with ugly cross marks ; and often there is failure of primary union in part of the scar.

A standard method of scalp closure has now been adopted by surgeons accustomed to operating on the head. The main principle is to close the scalp in two layers with interrupted stitches of fine silk or thread (Commercial size, No. 28, black silk). The deep layer of sutures joins the thin but firm galea aponeurotica and the sutures are placed 1 cm. apart ; this approximates the scalp and takes all the tension. The sutures are cut close to their knots and are buried in the wound. The superficial stitches are then tied only tightly enough to bring the superficial edges of the wound together, and they can all be removed within forty-eight to seventy-two hours. The two layers are effectively hæmostatic, and it is not necessary to ligate scalp vessels. As the wound heals its scar is small and there are no cross marks ; on the forehead the scar should eventually be almost invisible. The buried stitches are not irritating even in a scalp wound that is slightly infected, and they do not give trouble if cut close to the knot. If silk or thread cannot be obtained, very fine catgut (00) may be used, though catgut produces more reaction in the tissues than does silk or thread.

Cleansing and excision of scalp wounds can only be carried out satisfactorily in an operating theatre and with good regional or general anæsthesia. The first step is to shave the scalp for a wide area (4 to 5 inches) around the wound. The wound edges are then opened and the depths are carefully examined for dirt, hairs, glass, bone and metal fragments. All of these should be meticulously removed, and, when it has been established that the dura is

intact, forcible irrigation with normal saline or Ringer's solution, or with a mild antiseptic such as proflavine sulphate (1:1000), will assist. Ingrained dirt cannot be removed except by excision; in scalp wounds the pericranium and loose connective tissue can be excised freely, but removal of the more superficial layers should be done as sparingly as possible, otherwise it may be difficult to get approximation without excessive tension. Not infrequently in gunshot wounds the missile destroys part of the skin, and then the cleaned excised scalp wound must be left open, or may be closed by a sliding graft. Light dusting of the wound with sulphonamides before closure is not irritating and is evidently a helpful measure against infection, particularly in those cases which arrive late at the C.C.S. and in which the wound edges are already reddened and oedematous. Scalp wounds can be excised up to three days and longer after injury. In the forward area, where no operating facilities are available, it is better to apply a moist flavine pack with firm bandage than to close the scalp imperfectly and without cleaning the depths of the wound.

SUMMARY.

A series of twenty-nine cases of recent gunshot wound of the head is described. The clinical syndrome of concussion is usually absent and careful study of those gunshot wounds in which immediate and sustained unconsciousness occurs may throw light on the mechanism of production of unconsciousness in blunt head injuries. In gunshot wounds, both those with dura intact (non-penetrating injuries) and with dura penetrated, focal neurological symptoms are more common than in blunt injury. These symptoms show a strong tendency to spontaneous recovery and this fact should be taken into account when considering the operative removal of foreign bodies and dead brain tissue from the brain itself. At this stage of the war no rules can be made about the operative treatment of intracerebral damage, though the case for early and thorough treatment of the parts of the wound superficial to the dura is clear enough.

Gunshot wounds of the scalp tend to be followed by infection of the underlying skull, subdural space, and brain unless they are thoroughly treated. The apparently trivial operation of cleaning and suturing a wound of the scalp is probably the most important neurosurgical operation of war.

Secretarial assistance with the case records of the hospital was provided by the Medical Research Council.

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SCABIES.

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(1) INTRODUCTION.

FROM the dermatological point of view valuable time is frequently lost in the training and efficiency of troops owing to infection by scabies, impetigo and epidermophytosis. Early diagnosis, rapid reliable treatment and preventive measures are necessary if satisfactory control is to be established.

The following paper, describing the results of 1,041 cases of scabies investigated and treated at the Skin Department, Connaught Hospital, will, I hope, contribute a little towards the elimination of scabies from the above-mentioned group, and it is hoped that the experience of the department in impetigo and epidermophytosis will be given at a later date.

(2) DEFINITION.

Scabies is a contagious disease caused by infestation with a mite, the *Acarus* or *Sarcoptes scabiei*, characterized by great itching, worse at night, by the "burrows" made by the pregnant female parasite, red follicular papules, evidence of scratching and often of secondary infection with pyogenic cocci. The "burrow" is usually not more than a quarter of an inch in length and appears as a whitish or erythematous raised line with often a vesicle containing clear fluid at the blind end. The *Acarus* may in some cases be seen as a whitish speck just distal to the vesicle, and can be removed for microscopical examination with the end of a fine needle.

(3) PARASITOLOGY.

The female *Acarus* is a minute white body about 0.3 millimetre in length, oval in shape, with four legs in front terminating in suckers, and four behind terminating in spines. The male is about half the size and is rarely found. The cycle from adult pregnant female may be represented thus :—

Pregnant female. (Burrows into deeper parts of horny layer.)
 3 days. moults. moults.
 Lays 40-50 eggs..... Larva..... 1st Nymph.....
 Female adult.
 2nd Nymph..... Impregnation..... Adult pregnant female.
 Male adult.

The development as far as the 2nd Nymph stage probably takes place in the original "burrow," scratching then takes place with the liberation of the adults thus facilitating spread to other areas. This cycle takes seven to thirteen days and it is stated that the adult female may under certain

conditions of warmth and moisture live apart from the body up to ten days, and that the ova may develop up to six to seven days. There is some evidence, however, that these limits are much too narrow and that infected blankets may transmit the disease weeks and perhaps months afterwards—attention is being directed to this point, and any evidence will be published at a later date.

(4) SYMPTOMS.

The primary symptom is intense itching, worse at night, coming on shortly after going to bed. This complaint may vary, and cases are seen with a widespread infestation with little complaint, whilst others with little to show will describe the itching as unbearable. Again, in cases with secondary infection, itching may be completely absent, and this is of paramount importance owing to the possibility of the correct diagnosis being missed, with the consequent further spread of the infection to others, and ineffectiveness of treatment of the individual affected.

The nocturnal character of the itching is best brought out by avoiding leading questions. If asked, "Of what do you complain?" this special character of the itching is usually volunteered and stressed by the patient.

(5) DIAGNOSIS.

The practice of the department is to strip the patient and make him face a window giving a good light. He stands erect, arms by the side, palmar surface of the hands facing forward. In this way the characteristic grouping of the eruption is seen at a glance in the great majority of cases and the following points are to be noted.

(1) The anterior aspect of the wrists, the inner and, in my experience, the outer, anterior aspect of elbow-joints, the anterior axillary folds are affected by a papular eruption, showing evidence of scratching with perhaps an occasional pustule or scab.

(2) The chest is usually clear, whilst the abdomen may be heavily and is often generously covered. The thighs, anterior surface, especially upper third, are almost always affected, but the really striking point is that the penis has in practically every case one, or maybe several, lesions, which in my experience clinches the diagnosis.

The importance of the penile signs are such that it is the practice of the department to doubt the presence of scabies, if they are absent, and therefore one should always search for them if not immediately obvious, since cases are frequently seen under Service conditions in which the penis, anterior surface of thigh, and perhaps abdomen are affected, and the interdigital clefts are completely free. This may at first sight appear strange; but the hands of the serving soldier are frequently washed, whilst on the other hand it is the general practice to sleep in the shirt and vest worn during the day, and consequently the female *Acarus* has a longer time to "burrow" into the areas mentioned. Two types of penile lesions are found, one most

frequently on the body of the penis, the other most frequently on the glans, and they may co-exist. That on the body is a slightly raised, elongated or oval-shaped papule showing evidence of having been scratched; and that on the glans usually has the well-known vesicle present, often unruptured.

The patient is now turned round, and then the almost complete freedom of the back from shoulders to nates is noted, whilst the buttocks usually show evidence of both papules and "burrows" which may extend laterally to the trochanteric surface on both sides. Next, closer inspection of hands, especially interdigital clefts, ulnar border and base of thumb is carried out, and a search made for the characteristic "burrows." Lastly, the legs and feet are examined, but in my experience a few scattered papules are all that are found in these areas.

It is to be noted that although the above distribution is in a general way followed more or less closely, all parts mentioned may not be affected simultaneously; but if the general picture is remembered, this, with the symmetry of the lesions and especially the penile signs, will help to avoid the risk of missing cases of scabies during the routine inspection of troops. Even in those cases with secondary infection superadded, the characteristic grouping of the lesions at once gives the clue to the cause, especially as the itching may be absent. In these cases, however, I have found that one group of secondarily infected scabies needs special mention, since the distribution is not typical and itching is nearly always absent. The characteristic finding in this group is numerous shallow, indolent ulcers on both legs, covered by an adherent scab, and surrounded by a blue zone of "erythema." Elsewhere little is noted, but if the possibility of scabies is remembered, closer search will reveal evidence of scabies, and here again the penile signs are rarely absent. Lastly, it should be noted that the face and neck are never affected.

Briefly then the clinical diagnosis depends on: (1) Itching, usually worse at night; (2) typical picture on inspection; (3) penile signs and points of predilection on hands and anterior axillary fold (these are valuable signs); (4) comparative freedom of back and chest, and absence of lesions from face and neck; (5) the presence of the characteristic "burrow."

(6) DIFFERENTIAL DIAGNOSIS.

In our experience the following are the conditions most frequently confused with scabies:—

(1) *Lice Infestation*.—Here itching is intense, and there is often a suggestion of a nocturnal tendency. This is I think again due to the fact that the shirt and vest are used for sleeping purposes and the warmth of the bed activates the parasite. However, the above method of inspection will show the long linear scratches between the shoulders and lower sacral region so characteristic of lice, and inspection of shirt and vest will clinch the diagnosis. In some cases of lice infestation, however, I have seen

scratched-top papules with a marked tendency to grouping round the anterior iliac spine, and the lower part of each axillary area, with no scratches between the shoulders ; and if this co-exists with a folliculitis of the thighs, which is very common in the serving soldier, the mistake is perhaps not so strange. Here, again, however, the grouping is different and the penile signs are invariably absent, and, as I have said before, this always throws doubt on the diagnosis of scabies. It must be remembered, however, that the two conditions may co-exist, but in my experience this is rare.

(2) *Pediculi pubis*, fleas, and, in those living under canvas, gnat bites, etc., are sometimes considered to be scabies, but attention to the main points of scabies infection as above outlined should prevent such mistakes.

(3) *Urticaria*.—This is a frequent source of mistaken diagnosis, especially in those peculiar cases occasionally met with under Service conditions of a fairly widespread eruption of red papules of an urticarial nature without any obvious surrounding zone of erythema. These papules appear in crops and itch intensely, but the penis is never affected, whilst I have found the papules present in the interdigital clefts. Some cases were so suspicious that the diagnosis was only proved by the absence of any relief after treatment, and, here again, the importance of the penile signs was justified. The common practice of giving saline purgatives in urticaria ought to be discontinued, as we find that often the only treatment necessary is to stop the saline, and the condition clears without any further trouble.

(4) In some early cases of pityriasis rosea itching was intense, and worse at night, but the developed eruption showed the true nature.

(5) *Venereal Sore*.—Some penile lesions were mistaken for venereal disease, but attention to the main points of both diseases should prevent such mistakes. However, in cases where exposure has occurred, it is wise to keep the patient under surveillance owing to the possibility of the subsequent development of syphilis on the original scabies "burrow." A few cases were complicated by gonorrhœa, showing the venereal nature of the disease in some instances, but this, however, was infrequent.

(6) Lichen and some cases of eczema with secondary infection were also thought to be scabies, but this was rare, and the true nature was apparent when the affected parts and the individual lesions were examined.

TREATMENT.

Disinfestation.—The importance of this part of the treatment needs hardly be stressed, since, without it, all treatment is futile. Points to be remembered are that all clothing possessed by the patient should be sent to hospital for disinfestation, especially the greatcoat which in warm weather is likely to be forgotten, and the cuffs might possibly cause reinfection later if this precaution is not taken. Again wristlet watches are so frequently used nowadays that the orderly in charge of treatment should pay special attention to their disinfestation. Blankets, etc., are the concern of the unit M.O., and neglect of this point will bring unsatisfactory results.

Treatment.—On February 12, 1940, the treatment of scabies by Danish lotion was introduced into the Skin Department at the Connaught Hospital. The “lotion” is a mixture of equal parts of isopropyl alcohol benzyl benzoate and soft soap, and was first introduced by War Office letter, A.M.D. 5/3367/40, dated January 2, 1940.

From February 12, to July 12, 1940, one thousand and forty-one cases were treated by this method with extremely gratifying results, as will be seen in the following table :—

No. of cases treated	Readmission	Non-disinfection of blankets	Wristlet watch	Reinfection from wife	Unaccountable
1,041	11	3	1	2	5

The details of the treatment are as follows : The patient is put into a bath (temperature 105° F.) and allowed to remain there for a quarter to half an hour. While still wet he is painted from the shoulders to his toes with the lotion, applied with a fairly stiff brush with a span of about three inches across the bristles. This coat is allowed to dry (usually taking about ten to fifteen minutes) and a second one applied. During application special attention is directed to parts commonly affected. The patient then dons “hospital blues” and is sent to his ward with special instructions not to wash his hands or put them in water for twenty-four hours. At the end of twenty-four hours a cleansing bath is given, lotio calaminæ applied, and after inspection the great majority are then discharged from hospital, i.e. twenty-four hours after admission. Lotio calaminæ is recommended for seven days after discharge and surveillance is carried out fourteen days later.

In heavily infected cases, and in those who have had the condition for more than ten days, a second treatment is usually ordered, but on this occasion painting is carried out in the evening, and the cleansing bath taken in the morning, as, in this way, the lotion is only in contact with the skin for about twelve instead of twenty-four hours.

Secondarily infected cases are treated as above on admission, and after the cleansing bath, local treatment is ordered, and most cases respond fairly rapidly to the judicious use of lotio calaminæ c̄ ichthyol 1 per cent, with the use of hydrarg-perchlor (1 : 5,000) applied by swabbing after a bath. When the secondary infection has cleared up, the patient is again painted on the day before discharge as a precautionary measure. The possibility that scabs of secondarily infected cases may contain the *Acarus* at some stage in its cycle, capable of developing under suitable conditions, has led us to endeavour to discharge these cases free from all crusts. This point is now receiving attention in the department.

During treatment it is advisable for both patient and orderly to wear eye-shields, as in the early days of treatment a few cases of marked conjunctivitis occurred. This cleared rapidly on routine treatment, but in my opinion the above precaution should be taken, as none has occurred since this procedure was adopted.

Complications.—Not the least gratifying result of the treatment is the complete absence of complications so common after the use of sulphur. There were no cases of secondary dermatitis due to the lotion in the series, yet on some occasions the lotion was in contact with the skin for forty-eight hours, i.e. treatment on day of arrival, cleansing bath next day, with immediate repaint and cleansing bath again the following morning. (Edema of prepuce, and occasionally of the scrotum, is common but disappears within twenty-four hours after taking the cleansing bath. A slight burning sensation is felt by most, but the complete absence of the itching due to the *Acarus* is so marked on the night following treatment, that inquiry must be made to elicit this fact. The conjunctivitis which occurred before the eye-shields were introduced has already been mentioned.

SUGGESTION FOR FUTURE CONTROL.

(1) *Blankets.*—It cannot be stressed too strongly that blankets are the chief means of spread of scabies infection, and unless strict control is instituted cases will continue to appear in their present numbers.

(a) *Blankets of the individual.* (i) Under war conditions the movement of troops from place to place is so frequent that some method should be devised to prevent blankets being mixed during transit, as I have found this a common method of spread. (ii) The disinfection of blankets of individuals sent for treatment is important. (iii) Disinfestation of all blankets left by men on posting to other units should be carried out.

(b) After vacation of barracks by troops, all blankets left behind should be disinfested before re-issue.

(2) *Hostels.*—These are another common source of infection and spread, since large numbers occupy the beds in a short space of time, and it would be utterly impossible to disinfect the blankets before being used again. To prevent the full effects of this source of infection, and that of the soldier who is infected in his own home, all men who go on leave, even for a week-end, should be inspected at the end of two weeks after returning to the unit, as well as on the day of return. In this way, spread of infection in the unit would at least be controlled.

(3) Attention should also be paid to the fact that soldiers carrying out guard work at night take their own blankets to the guard-room bed, which must facilitate the spread of scabies as the "biscuits" on these beds are there permanently.

(4) Since scabies is not a common disease in civil life, lectures and demonstrations on scabies should be arranged in the Skin Departments of the various Commands.

(5) A weekly return of the number of cases of scabies occurring in each Command should be made showing : (i) Number of cases developing in the Command. (ii) Number of cases discovered on arrival in the Command, (a) From other Commands (Command to be stated), (b) From civilian life.

The real value of the measures taken against scabies by the different Commands could then be assessed, and any striking differences investigated.

CONCLUSIONS.

1,041 cases of scabies were treated by Danish lotion in the Skin Department at Connaught Hospital, between February 12 and July 12, 1940, with the results given above.

These results show that this method has advantages over other forms of treatment, and that it should therefore be adopted as the routine Army method for the treatment of scabies.

The advantages are as follows : (i) Reduction of hospitalization time to twenty-four hours. (ii) Absence of complications due to treatment. (These two factors reduce the number of beds which must be kept available for cases of scabies, and also markedly reduce the period of incapacity of those affected.) (iii) Reliability is not sacrificed to speed, as the results given amply demonstrate. (iv) The method is easily carried out after a short period of instruction of personnel.

The method of clinical examination of suspected cases carried out in the department is described, and will, I hope, be of help to others in the diagnosis of scabies.

Suggestions for the future control of scabies are also given, and should, if carried out, lead to a reduction of the incidence of scabies amongst the troops.

ANTI-SCATTER TREATMENTS FOR WINDOW GLASS.

NOTES FROM THE INFORMATION BUREAU OF THE BUILDING RESEARCH STATION¹

VARIOUS methods which can be adopted to provide protection from flying glass from windows broken by blast have been described in publications² of the Ministry of Home Security ; they include such measures as the provision of various forms of screens and shutters, the fixing of wire mesh and, finally, the application of adhesive treatments to the glass itself. It is with the last named that this note is concerned. Tests of such materials are undertaken for the manufacturers at the Building Research Station and arrangements have recently been made whereby a list of those of them that have been tested and approved as affording a useful measure of protection by limiting or preventing the scattering of the glass fragments will be kept at the Station and at the Research and Experiments Branch of the Ministry of Home Security. Firms having a material which is included in the approved list will be authorized so to describe it in their advertisements.

In view of the number of inquiries that are being received regarding such treatments, and notwithstanding that it is not the general practice in Government publications to mention proprietary materials by name, it has been considered useful in present circumstances to publish the present note which discusses the various types of adhesive treatments and includes a list of materials that are at present (September 19, 1940) on the approved list. The list is subject to alterations by additions and, maybe, subtractions, but the arrangement whereby firms having materials on the approved list can advertise them as such will serve as a means for keeping it up to date. Further, the practical recommendations included in the note are given in the light of information at present available and may be subject to some modification, though practical experience gained so far has served to confirm that they are well founded.

It should be realized that no treatment applied to the glass will prevent its being broken, nor will even increase its chance of remaining unbroken when a bomb explodes nearby. Moreover, an approved material will not give good results unless it is properly applied, i.e., applied in accordance with the recommendations made in this note.

The present note mentions four different types of treatment. It is not intended to suggest that all four types afford an equal measure of protection, but tests have shown that all the materials named, if properly applied, are useful. The choice of a particular type of treatment for a particular job must be left to the user, since it will depend upon various considerations,

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² e.g., "A.R.P. Memorandum No. 12—the Protection of Windows in Commercial and Industrial Buildings." "Your Home as an Air Raid Shelter."

such as the size of the panes, the importance of the windows to be protected, cost, etc. Moreover, supplies of any one type of material may not always be immediately available and possible alternatives may have to be considered.

GENERAL NOTE ON APPLICATION.

Before any treatment is applied it is important that the glass should be clean and free from oil or grease. When using any proprietary article, attention should be paid to the manufacturers' instructions for its use.

(1) *Textile Materials.*

According to tests, almost any strong textile netting, such as curtain net, or similar fabric can provide good "anti-scatter" protection if it is stuck firmly to the glass.

Nettings can be obtained for the purpose either plain or ready-treated with adhesive. With the latter type, there are various methods which different manufacturers recommend to get the best results from their own materials, e.g., (i) Dip the netting in water for one or two seconds only, then shake out the excess water and apply the net to the glass; (ii) moisten the netting by spreading it on a wet cloth; (iii) wet the glass, and then apply the dry netting, patting it into place with a wet cloth.

The material should be cut large enough to allow for shrinkage and to permit of it being carried over the frames and stuck to them as well as the glass.

Plain ungummed netting can be affixed with any convenient strong adhesive, e.g. cold water paste, flour paste or gum. The adhesive is brushed freely on the glass and the netting pressed on. If the window is one which is exposed to hot sunshine the addition of a little glycerine (say 5 per cent) to the adhesive will help to prevent it from drying out completely and becoming brittle.

In whatever way the netting is fixed, i.e., whether it is of the ready-gummed type or a plain material applied with paste or gum, its adhesion will certainly be affected sooner or later if the netting is repeatedly exposed to damp conditions; if, therefore, the window is one which opens or if it is often subject to condensation, the netting should be protected with a coat of varnish and in fact it is a useful precaution always to varnish round the edges at least, or secure them with adhesive tape to prevent them coming unstuck.

While fixing, it is often convenient to hold the top of the netting in position by drawing pins or (in the case of steel frame windows) with adhesive tape.

Although netting applied in either of these ways will generally be quite effective in preventing glass flying, the treatment will not necessarily be strong enough to hold up large panes of heavy glass and keep the fragments in place after the window is broken. A stronger and also a more waterproof job can be made by bedding the netting in a good elastic varnish; a full

coat of varnish is brushed on the glass, allowed to get tacky and the netting applied. Finally a further coat of varnish is applied over the whole area.

As the number of nettings which has been tested is large, the list of those at present approved is given in an appendix to this note.

(2) *Transparent Films.*

A good degree of protection can also be obtained by applying transparent film, of which there are many different makes. Those tested have been of two types, namely Cellulose film and Cellulose Acetate film.

A.—(a) *Cellulose Film.*

The following materials have been approved :—

(1) “Celilynd.”—British Celilynd Ltd., Burwell Works, Lea Bridge, Leyton, E. 10. (In this case the film was reinforced with light textile netting.)

(2) “Cellophane.”—British Cellophane Ltd., 17-19, Stratford Place, W.1.

(3) “Diophane.”—Transparent Paper Co., Bury, Lancs.

(4) “Rayophane.”—British Rayophane Ltd., Wigton, Cumberland.

(5) “Sidac.”—British Sidac Ltd., St. Helens, Lancs.

To be effective, the thickness of the cellulose film should be equivalent to a “substance” of not less than 60 grammes per square metre.

In applying cellulose film it is important that the adhesive should be flexible, i.e., one which does not become brittle on drying. Ordinary liquid gum can be used if glycerine or treacle is added in the proportion of about 1 teaspoonful to 2 tablespoonfuls of gum, or alternatively, an adhesive can be made from gum arabic and glycerine as follows :—

Crush the lumps of gum arabic to a powder. Into $1\frac{1}{2}$ pints of hot water sprinkle 1 lb. of the powdered gum, stirring continuously. Keep the mixture hot (in a double saucepan) till all the gum is dissolved, stirring from time to time. Then cool and stir in 7 oz. of glycerine.

If glycerine should be unobtainable, treacle may be used instead.

The adhesive should be brushed on the glass and the dry film applied with a roller, preferably in strips say 4 inches wide and placed side by side. The film should on no account be wetted or dipped in water before it is applied since this weakens the film and is likely to make it ineffective.

(b) *Self-adhesive Cellulose Film*, i.e. film ready-coated with a tacky adhesive ; this type of material is usually supplied in rolls of widths varying from 1 inch to 4 inches.

The following materials have been approved :—

(1) “A.R.P. Window Tape.”—British Cellophane Ltd., 17-19, Stratford Place, W.1.

(2) “Cerrux.”—Cerron Ltd., Kingston-on-Thames. (In this case the self-adhesive film is supplied together with a varnish ; the two together constituting the “Cerrux Process.”)

(3) “Durex.”—Durex Abrasives Ltd., Arden Road, Adderley Park, Birmingham, 8.

(4) "Sellotape."—Adhesive Tapes Ltd., Brunel Road, Old Oak Common Lane, Acton, W.3.

(5) "Transotape."—Messrs. John Goshon & Co., 1-6, Beech Lane, E.C.1.

Self-adhesive film has the advantage that it needs only to be pressed on the glass (again with the aid of a roller) and gives a better finished appearance than plain film applied with a separate adhesive. It is not absolutely necessary to cover the whole of the glass with this material, but naturally the closer the strips, the greater will be the protection.

When using this cellulose film it should be carried to the edge of the glass but not over the frames. The reason is that it tends to shrink slightly on exposure and if attached to the frames it will tend to lift at the edges of the glass.

N.B.—Since cellulose film, whether plain or self-adhesive, is affected by moisture, it is recommended that the treated panes should be given a waterproofing coat of a good pale varnish or lacquer.

B.—(a) Cellulose Acetate Film.

The following materials have been approved :—

(1) "Bexoid."—B.X. Plastics Ltd., Hale End, E.4.

(2) "Clarifoil."—British Celanese Ltd., Celanese House, Hanover Square, W.1.

(3) "Dialux."—Dufay Chromex Ltd., Elstree, Herts.

(4) "Erinofort."—Erinoid Ltd., Stroud, Gloucester.

(5) "Rhodophane."—Messrs. May & Baker Ltd., 42/3, St. Paul's Churchyard, E.C.4.

(b) Cellulose Acetate Film Reinforced with Textile Netting.

The materials supplied by the following firms have been approved :—

(1) Cellofabrics Ltd., 11, Gillingham Street, S.W.1.

(2) Messrs. Dobsons M. Browne & Co. Ltd., DelBeta House, Nottingham.

(3) Dufay Chromex Ltd., Elstree, Herts.

Cellulose acetate film cannot be stuck to glass satisfactorily with ordinary gum or paste but most manufacturers can supply suitable adhesives for their own materials or suggest recipes for making them up.

(c) Self-adhesive Cellulose Acetate Film.—This type of film closely resembles in appearance the self-adhesive cellulose film mentioned above and is used in the same way. Varnishing is not quite so necessary in this case as cellulose acetate film is less affected by moisture than cellulose film ; nevertheless varnishing helps to preserve the film and adhesive and is, therefore, recommended.

The film marketed by the following firm has been approved :—

Durex Abrasives Ltd., Arden Road, Adderley Park, Birmingham, 8.

(To be continued.)

NOTES ON THE GEOLOGY OF THE QUATERNARY DEPOSITS OF THE "PIANURA PADANA" (PLAIN OF THE RIVER PO) WITH THE RESULTS OF BACTERIOLOGICAL AND CHEMICAL EXAMINATIONS OF SOME POTABLE WATERS DERIVED THEREFROM.

BY P. R. McNAUGHT, M.D., CH.B., D.SC.GLASG., D.P.H.CAMBRIDGE,

*Medical Officer of Health, City of York,
Officer in Charge Hygiene Laboratory, Lines of Communication, British Army in
Italy, 1918.*

THE ORIGIN AND NATURE OF THE DEPOSITS.

At the end of the Pliocene period a great tongue-shaped gulf ran westwards from the head of the present Adriatic, bounded to the north and south by huge foldings which had occurred in Miocene times and led to the formation of the Alps and Apennines. Torrential streams from the recently elevated mountains spread far and wide their debris over the site of the present plain. To these accumulations were added, especially on the Alpine side, but to a lesser extent also on the Apennine, those of the glaciers flowing down the valleys during the glacial period and forming immense amphitheatres across their exits on the plain, through which flowed rivers in deep gorges. Examples of these are seen on the course of the rivers Dora Riparia, Orco, Dora Baltea, Ticino, Adda, Oglio, Mincio, Adige, Piave and Tagliamento. In the moraine surrounding Ivrea the debris is piled up to a height of 600 metres. The arc of the Garda moraines stretches for about 100 kilometres.

In many instances lakes are enclosed by the mounds, destined in the course of the ages to be filled up and converted into marshes and later into deposits of peat. The cones of the torrential rivers and the moraines comprising this sub-Alpine zone go to make up an irregular country, arid and stony, and of but slight value for agriculture.

Still further from the mountains stretches a zone of coarse sediments which apparently once covered the entire plain commencing from the region of moraines and insinuating itself between them. Like the previous zones it is due to deposits from the mountain torrents spreading far and wide a thick layer of transported material on reaching more level country, in which the momentum of the streams is suddenly greatly diminished. Typically this formation gives rise to plateaux (altipiani diluviali) composed of the debris of the glacial moraines mingled with alluvial sands and gravels, through which the present-day streams have cut their way, and to whose margins the plateaux slope more or less sharply.

These regions are known as "vaude" or "brughiere" (heaths) in Lombardy. Whilst a part of the material betrays its glacial origin the greater portion is composed of sands and gravels, brought down by the rivers, with pebble beds sometimes cemented to form conglomerate "ceppo."

The plateaux tend to be somewhat arid, and being difficult to irrigate are in parts sterile, in others utilized for cultivation of the vine and mulberry. Peculiar climatic conditions have in places transformed the soil to very considerable depths into a sandy clay of a red colour, "ferretto," related to the laterite of the tropics.

At the same level the Alpine rocks are sometimes affected while the moraines seem to escape the damage.

While the lower plain is composed mainly of deposits of later date, there still remain isolated masses of the more ancient formation which have resisted denudation, e.g. the Hill of San Colombaro, standing 130 metres above the plain (144 above sea level), composed of blue clay and yellow sand of the Pliocene capped by the deposits of the altipiano diluviale.

Nearer the Po in the plain proper ("zona bassa"), the deposits consist of finer materials and in the vicinity of the Po and its tributaries there are alluvial formations laid down by the rivers. Thus the Italian geologists

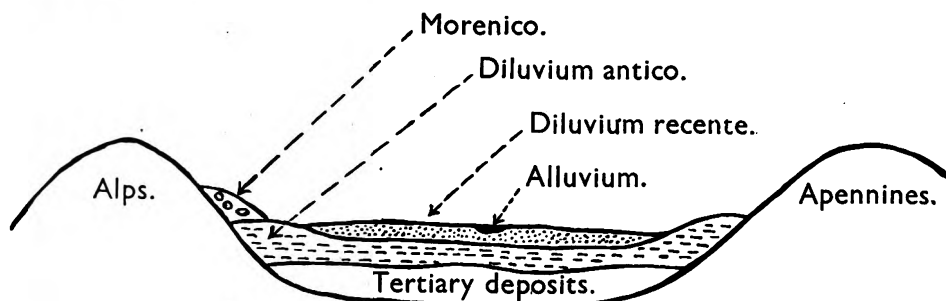


FIG. 1.

recognize in the lower plain ("zona bassa"): *a.* "Alluvium" of modern river system; *b.* "Diluvium recente"—the older alluvial deposits; and in the higher plain ("zona subalpina") of altipiano diluviale; *c.* "Diluvium antico"—partly alluvial from river fans, partly of glacial origin; *d.* "Morenico"—the glacial moraines.

As already noted the upper plain by reason of the coarse material of the soil of which it is composed tends to be arid owing to ready absorption of rainfall. Thus we find there occurs near the junction of the diluvium antico with the diluvium recente, a line of springs, "linea dei fontanili," or "linea delle resorgive," giving rise in parts to marshes. In addition to the springs, water bearing strata are to be found very near the surface, e.g. at Milan 2 to 4 metres and strata yielding a better quality of water at 7 and 14 metres.

RAINFALL.

The most copious rains fall in October. There are on the average 106 days per annum on which rain falls, being considerably fewer than in

Central Europe generally. Rain tends to fall in sharp downpours, rather than in fine persistent showers. Periods of drought are rare. Snow is recorded usually nine days per annum between the end of October and the middle of April. In some winters the plain is buried in snow to the depth of several feet so that traffic is held up on the roads and railways. The winter is the driest season, the autumn the wettest, as shown by the following table from Fischer [1] :—

Percentages of annual rainfall (in millimetres).

					Winter.	Spring.	Summer.	Autumn.	Year.
Torino	..	..	..	..	14.7	26.3	31.6	27.3	789
Milano	..	..	..	..	21.3	23.8	23.9	30.9	966.5
Udine	..	..	..	..	21.2	24.0	27.3	27.7	1384
Bologna	..	..	..	..	18.4	20.1	29.7	31.8	536

The area may be roughly divided into four regions of rainfall :—

(1) Central plain of Po (650 to 800 mm.), Tortona, Voghera, Pavia, Mantova 644, Legnago, Bologna 659, Faenza 738.

(2) A belt to north and one to south of the river including the northern slope of the Apennines (800 to 1,000 mm.), Torino 852, Cremona 804.

(3) Approaching the southern slope of the Alps (1,000 to 1,200 mm.), Milano, Treviso 1,035.

(4) Alps north of the plain (1,200 to 2,437), Tolmezzo (Carnic Alps) 2,437.

The conditions, therefore, favour the supply of deep wells of artesian types, the heaviest rainfall being at the periphery of the basin.

CONTOUR.

The plain lies in a great trough with steep sides and is roughly triangular in shape with the Alps to the north and the Apennines to the south, while the base is formed by the Adriatic. The Po between Turin and the sea may be taken as occupying a perpendicular dropped from the apex to the base.

A rise in sea level or a subsidence of 100 to 150 metres would practically restore the condition of the Pliocene time by flooding the plain. The limiting slopes from the mountains to the plain are very steep and thence from north and south are very gentle to the Po.

The plain from west to east also tends very gently to the sea, the Po standing at 212 metres at Turin, 45 metres at the confluence of the Adda, and 9 metres at Ostiglia above sea level. Between Chivasso and Piacenza the fall of the river is approximately 1 in 1,000, between the latter city and the sea, 1 in 2,000. Hence the Po carries gravel as far as Piacenza, beyond that only sand and mud. The volume of its flow varies enormously, from 214 to 5,149 cubic metres per second, and brings down 42,760,000 cubic metres of debris per annum (E. Di Poggio) [2]. Its tributaries from the Alps, fed by the greater rainfall, have been the means of pushing the line of the river in its upper course much to the south of the mesial line of the valley, eastward it becomes more central. The rainfall, as we have seen, on the Apennines, is considerably less than that on the Alps, the rivers are not fed by glaciers and have no lakes to equalize their flow, hence although their flow is at times very great, in the dry season they almost disappear.

This great mass of sediment laid down since the close of Tertiary times, apparently rests on a foundation of Pliocene deposits, of which an almost continuous band dips down on the southern fringe of the plain. Detached portions re-appear on the Alpine border, though the quaternary deposits in the north are banked up against all the formations from the Archæan to the Tertiary. Borings have reached the Pliocene at Forli 80, Reggio at 90 metres and Revenna 120 metres, but apparently the trough deepens

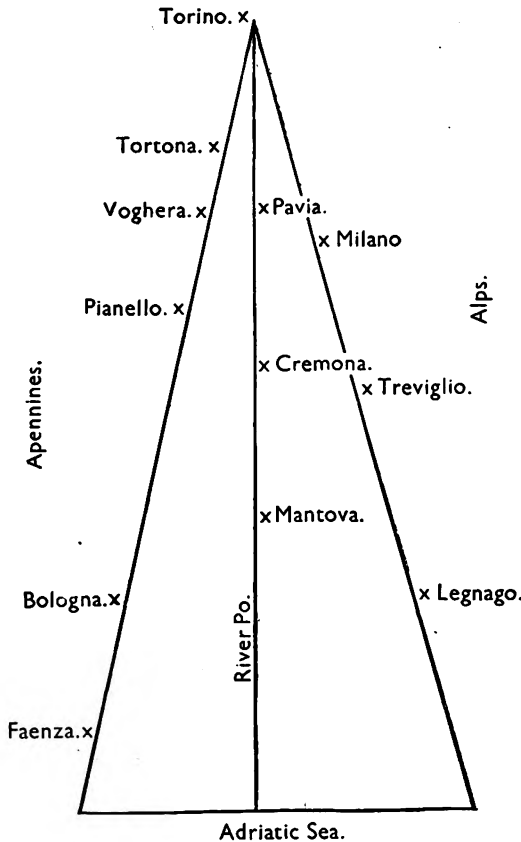


FIG. 2.

to the north, as in the district between Milan and Venice it has not been reached at over 200 metres (Fischer).

WATER SUPPLY.

The plain is covered by a close network of channels and ditches, which are important for irrigation and drainage, but owing to their universal pollution by washings from cultivated land and roads, and in villages their use as washing-places and receptacles for filth, they must be left out of count as possible sources of potable water supply. Wells drawing their water

from the subsoil must in general be looked upon with suspicion, especially when sunk in the neighbourhood of dwellings.

The rivers, some of which in the dry months almost disappear and others such as the Po in which the flow is more or less abundant throughout the year, but which contains much suspended matter, and are polluted to greater or lesser extent in the plains, do not contribute to the solution of the problem.

There remains then for the towns recourse either to long aqueducts, bringing water from the hilly regions, or deep wells.

For example, the town of Cremona stands at least 40 kilometres from any possible hill supply, so that on the ground of expense, recourse to deep borings appeared the only possible way out of the difficulty. The first attempt was made with the idea of obtaining an artesian supply to obviate the necessity of pumping, especially as similar attempts had met with success no further away than Mantova. Though water was struck, it did not rise to the surface and did not appear to be plentiful, save near the surface. The project was then abandoned for a time after boring 233 metres (Grasselli) [3]. Fresh borings later showed water at 40 and 100 metres, not rising to the surface, with an objectionable odour and taste and of a turbid character. Finally, twelve trial borings cleared up the situation. It was found that there were four main water bearing strata, and some minor ones of poor yield :—

- (a) A superficial met with at 3 to 6 metres from the surface, of good physical character, but apt to be polluted, as in general it was not protected by an impervious stratum.
- (b) A medium at 16 to 22 metres from surface, also physically of good quality, but apparently not protected, and from its chemical composition, probably related to the superficial water.
- (c) A deep well at about 40 metres from the surface, 2 metres above sea level, protected at 26 to 29 metres from surface by a bed of clay. This water rose to within 4 metres of the surface, was chemically and bacteriologically pure, but became turbid on standing. It contains iron to the extent of 0.2 to 0.5 parts per 100,000. It has also a slight odour of hydrogen sulphide. Temperature 13.4° to 13.6° Cent.
- (d) A very deep well at 100 metres covered with 10 metres of clay. This does not become turbid as it contains practically no iron, but it smells and tastes of hydrogen sulphide. Temp. 14.6° to 14.8° Cent.

Choice fell finally on the 40 metre water, as it was found that by pumping to an elevated tank, from which it was distributed in a fine spray to a lower one, the sulphur gases passed off into the atmosphere (a very distinct odour of H_2S is felt on entering the hall containing the purification plant).

The same process causes precipitation of the iron salts and aeration of the water, while subsequent passage through "Bollmann" filters of siliceous sand removes the iron so efficiently that none is detectable in the town supply by the ordinary tests. The present water supply is derived from five wells sunk through the alluvium on which the lower part of the town stands, the

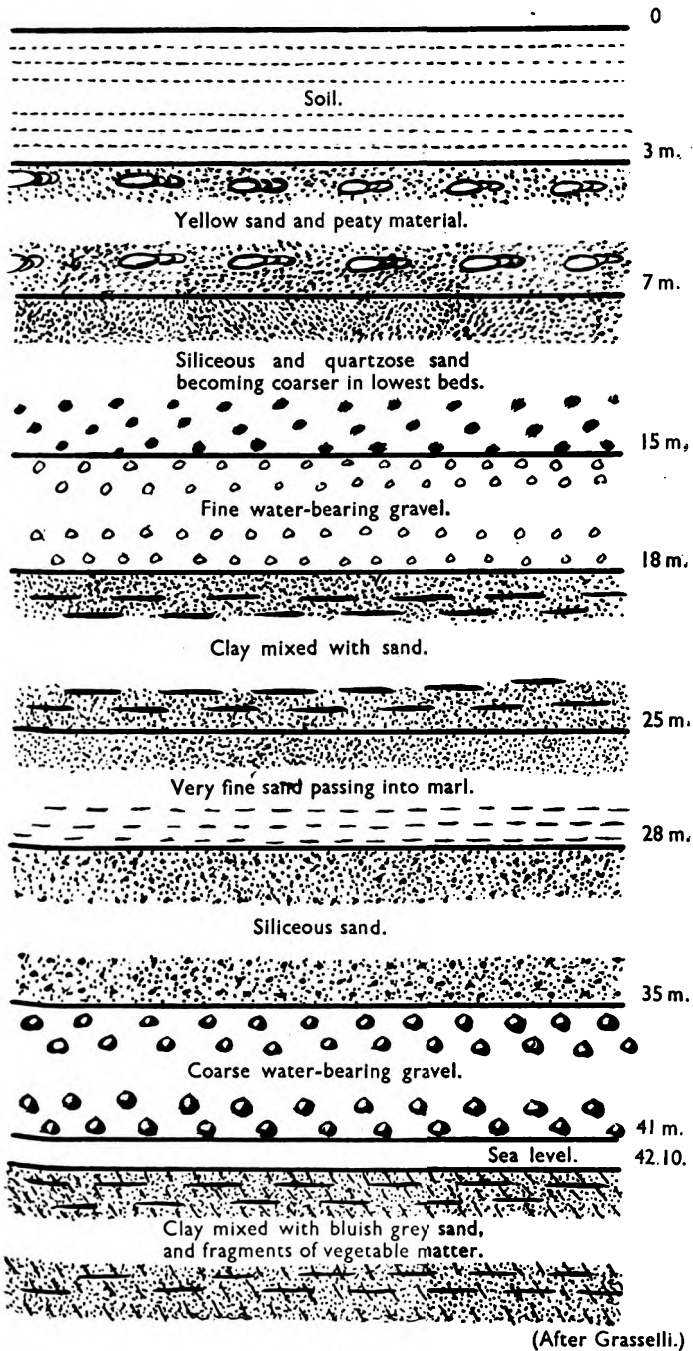


FIG. 3.

higher portions being on the "diluvium recente." After being freed from iron it is pumped to a high level cistern for distribution. From the accompanying section (fig. 3) it will be seen that the soil through which the bore passes is composed of alternating layers of sand, gravel and clay and a similar structure has been met with to the greatest depths reached.

Comparison of a series of sections compiled from the results of fourteen borings by Augusto Stella [4] indicates that these beds are not laid down horizontally but in a lenticular form. Hence the disposition of the beds of coarse sand and fine or coarse gravel in which water is found are struck at varying distances above or below sea level. Constantly, however, water is struck at 20 to 30 metres above sea level, as a rule in sand or gravel, but in few cases is a layer of clay met with in reaching it, hence it is unsuitable as a supply, presumably being subject to admixture with the ground water.

Between 10 metres above and 20 metres below sea level there is also constantly reached the bed of water bearing gravel or coarse sand from which the Cremona supply is drawn, and in every case a bed of clay has been pierced in drilling to it.

Three wells strike another water bearing bed at depths of 40 to 60 under sea level, while one has reached water again at 100 metres.

NATURE OF SUB-SOIL.

Sand is the chief component of the sub-soil with lenticular masses of gravel and clay and these deposits are met with to the greatest depth so far reached in the Cremona region, 233 metres.

The sole difference passing from surface to the depths is that the yellow colour of the sand after the first water bearing stratum has been traversed becomes greyish or greyish green. Water percolating from the surface has been gradually deprived of its atmospheric gases and loses its oxidizing power, hence the difference in the deeply buried sediments.

The sand is of varied origin, but largely composed of quartz with more or less mica and calcareous material. Calcium carbonate is at a minimum in the coarse sand, while the percentage rises in the finer to a maximum in the more clayey sands.

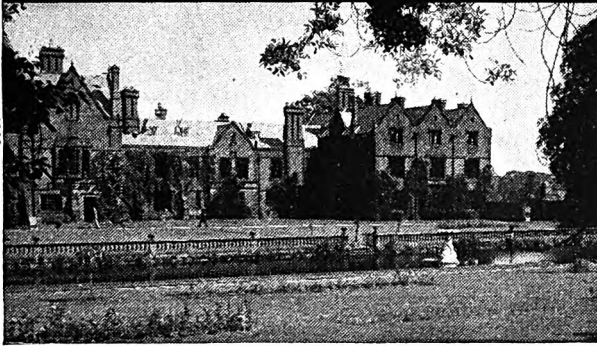
The clay is usually sandy and only exceptionally, as in the layer 10 to 20 metres above sea level, is it clay in a strict sense. Speaking generally, it is calcareous clay or marl.

The gravels, especially the fine, contain a fair amount of calcareous material with occasional pebbles and greenish concretions of this nature. At all depths the gravels and pebbles indicate by their appearance derivation from pre-alpine and interalpine regions (basins of Oglio and Adda) and consist of quartz, gneiss, mica schists, tonalite and serpentine, while the secondary rocks are represented by limestone pebbles, variegated schists, sandstones and flints.

Traces of vegetable remains are occasionally met with indicating old lake deposits and peat formation.

(To be continued.)

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Editorial.

NUTRITIVE VALUE OF WHITE FLOUR.

IN the September number of the *Journal*, 1940, we wrote an Editorial on food, and gave the recommendations on bread of the Accessory Food Factors Committee of the Lister Institute and the Medical Research Council. They suggested that flour for the bread of the people should contain the germ of the wheat grain, as much as possible of the aleurone layer and the finer portions of the bran. The flour should be extracted to the extent of 80 per cent, instead of 73 per cent as at present. The flour must not be bleached or improved by oxidizing agents. They thought the public would benefit by the addition of calcium to the flour from which bread is made. The use of baking powder should be discouraged.

The Ministry of Food proposed to reinforce white bread by the addition of Vitamin B₁ in order to make its nutritive value more nearly equal to that of wholemeal. Ordinary straight-run flour, 73 per cent extraction, is not only poorer than wholemeal flour in Vitamin B₁, but also has a lower content of B₂ vitamins, minerals and protein. Further, experiments carried out in the Division of Nutrition, Lister Institute, have shown the combination of proteins in wholemeal flour have a higher nutritive value for growth, weight for weight, than those of the endosperm. Vitamin B₂ complex includes : (1) riboflavin, (2) nicotinic acid, (3) vitamin B₆ and (4) the substances grouped under the name "filtrate factor." One of the "filtrate factor" group has been isolated in a pure state as pantothenic acid ; this group also contains substances known to be connected with the prevention of certain forms of anæmia. The inferiority of white flour in vitamin B₁ is generally accepted, but its inferiority in vitamin B₂ is not so widely conceded. Dr. Harriette Chick has demonstrated this inferiority in a series of experiments with groups of rats. She compared the nutritive values of white and wholemeal flour when the deficiencies of the former in vitamin B₁, in fat soluble vitamins, in protein and in minerals were made good, but any deficiency in B₂ vitamins was uncorrected. Two diets were arranged consisting as largely as possible of white flour and wholemeal flour respectively, with the addition of a salt mixture to remedy the known defects of cereals in this respect, and of extra protein in the form of casein to bring the amount of protein up to the optimum proportion for the growing rat. The samples of wholemeal flour and straight-run white flour (73 per cent extraction, generally used for making bread) were obtained from the same grist. Pure vitamin B₁ in optimum amount was given to the rats on the white flour diet, so that the rats received 3 international units per head daily. This is an optimum for B₁, so that any inferiority in the rats on white flour could not be attributed to lack of B₁.

The rats receiving the wholemeal flour obtained their vitamin B₁ from it, and any other vitamins of the B₂ complex which might be present; any superiority which they might show over the rats receiving the white flour must be attributed to their higher intake of vitamin B₂ complex, or some other unknown factor. During the first two weeks the average weekly weight increase on the white flour (11.8 weekly) was about half that on the wholemeal diet (22.8 weekly). The food intake in the former case was also less, the average being 35.3 g. dry weight of food, as compared with 53.2 g. on the wholemeal diet. The digestibility of the white flour was superior, the weight of faeces passed being about a fifth of that on the wholemeal diet, but the utilization of the assimilated food was inferior. The average weight of dry food ingested during this period of two weeks corresponding to 1 g. increase in body-weight was 3.02 g. on the white flour diet, while on the wholemeal diet it was 2.47 g. When allowance is made for loss in the faeces, these figures become 2.91 and 2.13. At the end of the second week the diets were changed: in the next two weeks the rats previously taking diet 1 received diet 2. They made an immediate spurt in growth, with average weekly weight increase of 24 g., while those changed from diet 1 to diet 2 suffered an immediate check, the average increase falling to about 7 g. per week.

Dr. Chick considers that the inferiority of white flour must be attributed to a shortage of B₂ vitamins. Further work is now in progress to determine in which constituents of this complex white flour is most seriously deficient. Preliminary trials indicated that in diet 1, deficiency of riboflavin was probably the most serious, though lack of "filtrate factor" may also have limited growth. It is not likely that lack of vitamin B₆ was responsible, for cereals are known to be good sources of this vitamin, which is distributed throughout the grain. Its presence has been demonstrated in starches of cereal origin, even when these have been highly purified.

Some will still doubt whether a diet that promotes growth in a young animal will necessarily promote the well-being of a human adult who is no longer concerned with growth but with doing a day's work. In the study of nutrition, growth is generally used as an index to show whether an animal is adequately nourished. The vitamins required for growth in the young and for maintenance in the adult are the same. The young and the adult require the same nutritional elements except that the young need relatively more of them. Adults have to balance the continuous process of loss or gain of nutritional elements in their tissues; the young have to do the same, but in addition have to put down new tissues. It may safely be concluded that if one diet does not enable the young to grow while another does, this is also more nourishing for an adult. If the experiments on rats are accepted as applicable to man they must be regarded as indicating that wholemeal bread will lead to better health and economy in foodstuffs, more particularly for the growing child as well as for women and men.

Clinical and other Notes.

A CARD INDEX SYSTEM FOR OFFICE RECORDS IN GENERAL HOSPITALS.

BY LIEUTENANT-COLONEL R. A. HEPPLÉ, *M.C.*,
Royal Army Medical Corps.

DURING the war of 1914-1918 the writer was for a period Registrar of No. 8 General Hospital in France. During this time a card index system of keeping hospital records was evolved which was found to be of very considerable assistance. Subsequently this method was adopted by all the hospitals in France for the remainder of the war. While serving in the present war at G.H.Q., the writer brought the matter to the notice of Major-General J. W. L. Scott, *D.S.O.*, *K.H.P.*, *D.M.S.*, *B.E.F.*, and at the request of the latter, a short talk on the question was given to O.s C. hospitals in the Dieppe Sub-Area, in November, 1939. As a result the system was adopted by the hospitals in the Dieppe Area, and subsequently in the Boulogne Sub-Area, and L. of C. hospitals. An initial supply of cards was printed locally, and subsequent supplies were obtained from the G.H.Q. Printing and Stationery Department.

Reports on the working of the system were asked for early in May, 1940, but owing to circumstances with which we are all familiar, such reports were never received. From conversation, however, with several O.s C. hospitals and Registrars, it was apparent that the method solved several difficulties encountered in record keeping in General Hospitals on active service, and it is felt that it might be desirable to place the details on record.

Briefly the system was as follows :—

The card employed embodied all the items in the A. and D. Book, and the layout was as follows :—

SERIAL NO.....	NAME.....	
REG. NO.....	RANK.....	UNIT
COY. BTY. OR TROOP.....	AGE.....	RELIGION.....
SERVICE.....	SERVICE IN (FRANCE).....	
DATE OF ADMISSION.....	WARD.....	
DIAGNOSIS		
DISPOSAL AND DATE.....		
REMARKS		

A card was completed for each patient on admission to hospital. Two filing cabinets were obtained, a small one for the cards of all patients actually in the hospital, and the other (much larger) for patients who had left hospital. (No great expense need be involved for filing cabinets—they can

be constructed by any local carpenter.) Cards were transferred from the small to the large cabinet when a patient was disposed of.

The space for the name was placed on the right hand corner of the card to facilitate collation and allow rapid tracing of any individual.

One clerk was definitely detailed to see that all cards were properly arranged and collated at all times.

Some of the advantages of the system were found to be :—

(1) As soon as the card is completed it forms a permanent record. The card never leaves the hospital office.

(2) An inquiry as to whether an individual is in the hospital, or has ever been in it, can be answered at once. Such an answer is quite impracticable if the A. and D. Book only is available, and the A.Fs. I. 1220 do not help as they are forwarded to the War Office as soon as possible after a patient is disposed of.

It was also found that the re-addressing of correspondence for patients who had left hospital was considerably facilitated by the use of the cards.

(3) It is possible to employ several clerks at the same time in making nominal rolls, a procedure which is not possible if the A. and D. Book only is available. Let us take the following actual example : A number of patients are proceeding to Convalescent Depot, others are being discharged to Base Depot, while a third party is being embarked on Hospital Ship. On receipt of the rolls from the wardmaster, each clerk detailed selects the cards required for his party from the small cabinet, and proceeds to make out the appropriate nominal roll, without in any way hindering the others.

(4) The cards can be quickly sorted in any way desired and nominal rolls made out accordingly. Head wounds, fractured femurs, mental cases, special types of medical case, etc., can be grouped on the nominal roll with a minimum of effort. It would appear that this would be of value in the distribution of convoys received from overseas.

Again, in furnishing A.F.W. 3110 to the D.A.G., 2nd Echelon (or 3rd Echelon in the war of 1914–1918) it was found to be a simple matter to furnish the return by regiments. This facilitated the work of the Echelon and was favourably commented on.

(5) The remarks column can be used for such entries as “A.F.B.117 rendered,” “Medical Case Sheet accompanied patient,” etc. It was the custom to mark such items as “PRISONER,” “MENTAL CASE,” “SELF INFLICTED WOUND,” in red ink at the top of the card.

Rubber stamps “No. ? Convalescent Depot,” “Hospital Ship ‘St. Andrew,’ ” etc., were purchased and used to denote the patients disposal of on the card.

Procedure on taking in a Convoy.—It is perhaps desirable to consider the method employed in taking in a convoy of sick and wounded with particular reference to the employment of the cards.

One must refer to the method employed in maintaining a record of the bed state :—

A smooth piece of wood (about 2 feet by $1\frac{1}{2}$ feet) was taken, and a series of nails driven through the wood to project on the other side. Each nail represented a ward, and the appropriate letter (or number) of the ward was printed beside each nail (*see diagram*).

*A	*B	*C	*D	*E	*F
*G	*H	*I	*J	*K	*L
*M	*N	*O	*P		

On each nail, slips of paper, each representing a vacant bed, were impaled, i.e. if there were 15 slips on the "A" nail, there were 15 vacant beds in Ward "A." The slips were, of course, marked with the ward letter. It was the responsibility of the Chief Wardmaster to ensure that this board was always kept up to date.

More elaborate forms of such a board have been employed, but the above is simple and satisfactory.

The officer receiving the convoy had the board on a table beside him. The clerks on duty were each given a supply of cards. One, or perhaps two clerks would be detailed to take particulars of stretcher cases, while the other clerks were seated at a table to take particulars of walking cases.

The officer, having seen the patient, wrote the diagnosis (or provisional diagnosis) on the appropriate slip. The patient, if a walking case, passed on (with the slip) to the clerks' table, where his card was made out. When a sufficient number of patients for any one ward had collected, they were conducted to the ward by an orderly.

If a stretcher case, after the card had been completed by the clerk detailed, the slip was handed to one of the stretcher bearers, and the patient taken to the ward.

When the taking in of the convoy was completed, the cards were collected from the admission clerks, and A.Fs. I. 1220 and the A. and D. Book completed from the cards.

The cards were then placed in their appropriate places in the small cabinet.

My thanks are due to Major-General R. W. D. Leslie, *O.B.E., K.H.P., D.D.M.S.*, Northern Command, for permission to forward this article for publication.

A CASE OF LOOSE BODIES IN BOTH ELBOW JOINTS, WITH A HISTORY OF AN UNUSUAL ACCIDENT.

BY LIEUTENANT-COLONEL J. C. ANDERSON,
Royal Army Medical Corps.

THE patient was a powerfully built young man, aged 24, weighing 14 stone. He was a splendid type of man, a recent voluntary recruit, who was particularly anxious to continue his military service. He gave no history of previous illness or accident.

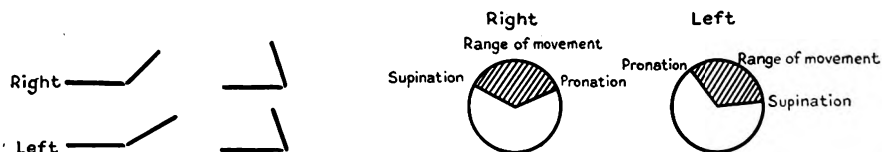
His civil occupation had been that of an overhead transmission linesman.

At the end of August, 1939, the belt by which he was suspended from the wires broke; he managed to catch hold of the wires and clung to them for a period of about eight minutes before being rescued by his mates. As he clutched the wires he wrenched his arms to a certain extent. His position during the eight minutes was precarious, as there was a drop of eighty feet below him.

After the accident his arms ached. He visited a "manipulative surgeon," who gave him a "good manipulation" and local application of ointment. He received no other treatment. He was off work for five days and then continued with his full occupation until the time of his enlistment. The only trouble experienced was the fact that he could not quite straighten his elbow joints. When he got slight electric shocks, quite a common experience in his occupation, the function of his arm improved temporarily. The question of compensation did not arise, as he felt that he had escaped an accident rather than that he had had one.

The condition of his arms was noticed by the medical officer of his unit during routine medical examination of recruits on November 27, 1939.

On examination, the region of both elbow-joints were visibly and palpably enlarged to a moderate extent. Palpation revealed a bony swelling on the posterior aspect of the right elbow between the humerus and the head of the radius. Another vague bony swelling could be felt on the antero-medial aspect of the joint. No definite bony irregularity could be felt on the left elbow. Movements of the elbow-joints can best be shown diagrammatically.



The X-ray appearances were rather unexpected. Others of his joints proved to be normal when X-rayed.

I find it hard to believe that the multiple loose bodies could be a result of his accident in August. At the same time it is doubtful whether a 14-stone man could have hung by his arms for eight minutes if such lesions were present. The explanation that I offer is that as a result of the overstretching, blood was extravasated into the joints, and that the loose bodies are a result of calcification of hæmarthrosis.

I take the liberty of quoting freely from a letter written to me by Mr. H. A. T. Fairbank, who has kindly examined the films and expressed the following opinion :

" . . . I am much interested in the films you sent me. I think one must certainly class this case as one of osteochondromatosis and, in my opinion, the loose bodies are not simply the result of trauma. By osteochondromatosis I mean a condition where there is an inherent tendency to the formation

of multiple loose bodies in the joint, most commonly, of course, the knee, but the elbow comes second. A history of trauma is common, but there is something more behind it in the way of a neoplastic tendency, though I don't think that the loose bodies are necessarily present before the injury. Most people, I think, believe that the bodies are formed in the synovial membrane



FIG. 1.—Lateral view. This shows the peculiar rod-like opacity in the upper end of the ulna.



FIG. 2.—Antero-posterior view. This shows numerous spherical shadows in the elbow joint. The appearances are similar in both elbow joints.

and later are extruded into the joint. I don't much like the suggestion that they arise in extravasated blood. I have seen a case following a sudden strain when a lad was hanging on the rings in a gymnasium, but that case was not of this multiple type. The point that has struck me very much is that in spite of the loose bodies the joint is remarkably clean and free from arthritic lipping. This case is exceptional in showing definite lipping.

“There seem to be two types, giving different radiological appearances. In one, as in your case, the bodies throw an oval or circular shadow with a fairly definite outline (possibly these are the laminated type which Timbrell Fisher speaks of); in the other the shadows are irregular and spicular with a very indefinite outline. This is the type, I think, which at operation shows the bodies to be largely cartilaginous, very nodular on the surface like blackberries, with an irregular calcified or ossified nucleus. In this type, there are cobweb-like vascular adhesions holding the loose bodies together, and to the synovial membrane, so that they are not really completely mobile. This possibly accounts for the absence of arthritic change.

“I am interested in that curious rod-like opacity in the upper end of the ulna in both arms. Just an anatomical peculiarity, presumably. I have seen these spots at this site, but I don't remember such an obvious ‘rod’ of bone.”

RHEUMATIC MANIFESTATIONS FOLLOWING RUBELLA.

BY MAJOR IAN MURRAY.

Royal Army Medical Corps.

REPORTS have been appearing recently regarding rheumatic manifestations following rubella. Since the considerable epidemic during last winter, such manifestations appear to have been not uncommon, although most previous authorities seem to agree that rubella is, normally, singularly free from complications. Majors Bennett and Copeman (*B.M.J.*, 1940, 1, 924) have recorded a series of cases in which very definite complications, chiefly of a rheumatic type, were encountered. In view of the interest which has been taken in this matter, it appears worth while to record the following two cases:—

Private C. was admitted to the Military Hospital, Edinburgh, on May 20, 1940, suffering from typical rheumatic fever. The knees and ankles were swollen and very tender. The temperature on admission was 100° F. The pulse was irregular and the rate 44. Three weeks prior to his admission, he had developed rubella and was for two weeks in an isolation hospital. He had been back at his unit for one week before he developed the signs of acute rheumatism. He was given sodium salicylate, and his temperature became normal after two days. The pulse remained markedly irregular, every third or fourth beat being dropped. A systolic murmur was heard at the apex with the systole immediately following a dropped beat, but otherwise the heart sounds were pure. An electrocardiogram was taken on May 22, 1940, with the following results:—

Vent. rate—irregular.

Mechanism—sinus arrhythm with sino-auricular block.

Axis—no axis deviation.

P waves—upright in all leads.

PR interval—20 second.

QRS complex—upright and varying in lead III.

T waves—upright in all leads.

Chest leads—sternal lead shows slight elevation of ST segment ;

T upright. Apical lead within normal limits.

Summary : Sinus arrhythmia with sino-auricular block.

The complete absence of a whole auricular and ventricular complex is seen in all the leads.

Although the pulse did not alter, he complained of no symptoms and had no further pain, and when he was transferred to a civilian hospital on June 6, 1940, he stated he felt extremely well.

Private D. In January, 1940, after eight days' Army service, this man developed rubella and was admitted to an isolation hospital. He gave no history of any previous illness. Two weeks later he developed rheumatic pains and was kept for a further fortnight in that hospital. Thereafter he was transferred to a civilian convalescent hospital where it was noted that a systolic murmur was heard at the base of the heart. The man himself had no further complaint of pain. For rather more than three months he was kept there, most of the time in bed. He was sent to me and I examined him on June 9, 1940. He was complaining of breathlessness and palpitation on exertion. A systolic murmur was heard at the pulmonic area, but there was no cardiac enlargement and no evidence of any organic lesion. He was a typical case of effort syndrome, and he was transferred to a rehabilitation centre. This case provides an interesting sidelight on the production of the effort syndrome.

BERMUDA VOLUNTEER RIFLE CORPS FLY TRAP.

BY MAJOR J. E. BROOKS,

Royal Army Medical Corps.

THE following modifications of the box fly trap, described on page 143, Army Manual of Hygiene, have been made by the Bermuda Volunteer Rifle Corps.

Many experiments were made with the box trap before the final product was evolved. The great objection to the box fly trap was that it was extremely difficult to kill off the flies and dispose of the bodies. If flit was used, no flies would come near the trap for days. Pouring boiling water over it caused the wires to rot.

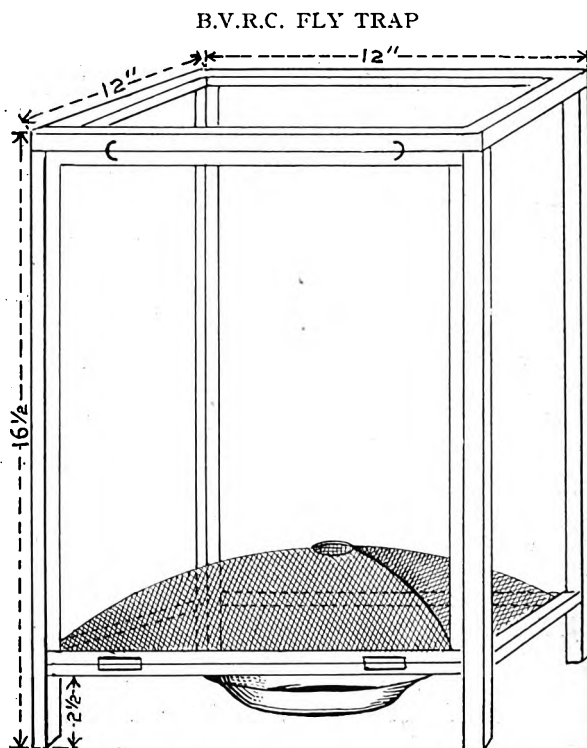
The fly trap now described overcomes these difficulties.

Important points in the construction are the wire cone in the base with a circular opening at the apex of the cone, the door on one side to open

outwards for emptying the flies, and the legs which should be a minimum of $2\frac{1}{2}$ inches from the ground.

In use a plate with some attractive bait—jam has proved most effective—is placed under the centre of the cone and level with the base of the frame. After feeding on the bait flies fly upwards and enter the trap. The slightest disturbance of the plate causes the flies to rush upwards and there is a mad scramble to get through the hole in the cone. When full the flies can be killed by simply placing over the ring of a stove.

The attached plan clearly shows the effectiveness of this trap.



Wood used	1-inch \times 1-inch Dressed Spruce
Wire	Fine mesh copper
Cone	4-inches above cross struts
Cone Opening	1-inch to $1\frac{1}{2}$ -inch in diameter
Soup plate found best container for bait	

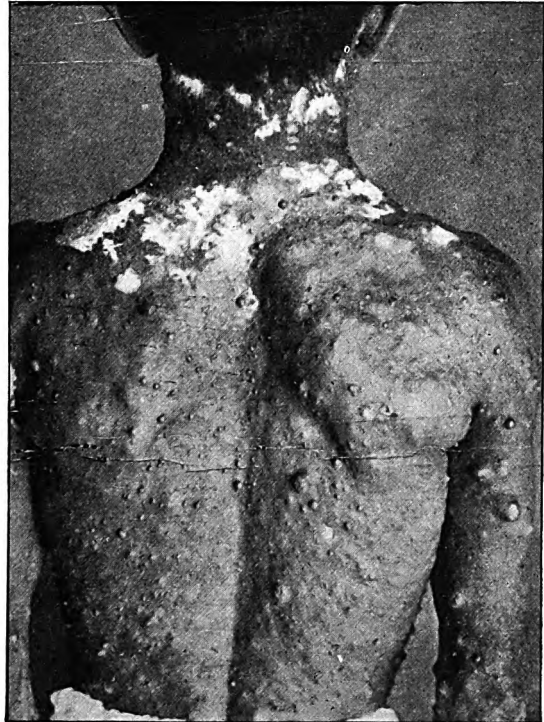
I have to thank Lieutenant-Colonel A. T. Gosling, Commanding Bermuda Volunteer Rifle Corps, for permission to submit these notes for publication in the Corps Journal.

AN UNUSUAL CASE OF VON RECKLINGHAUSEN'S DISEASE.

BY CAPTAIN R. J. MCGILL,
Indian Medical Service.

THE accompanying photographs illustrate a case of von Recklinghausen's disease in a dhobi, I.H.C., aged 42.

Every part of the skin, except the palms and soles, is thickly studded with sessile or pedunculated tumours, large and small, varying in size from a pea to a golf ball. Even the face, including the eyelids, and the scalp are involved. The tumours are soft, elastic and painless.



The photographs show large patches of leukodermia on the left shoulder and left lower abdomen.

The tumours show no evidence of malignant change and an X-ray of the chest revealed no bony erosion, such as results from a neurofibroma of an intercostal nerve. No mucous membrane is involved, there is no excessive pigmentation, and he is mentally normal. There are no symptoms of neuritis such as would result from involvement of a nerve, and no peripheral nerve is perceptibly thickened.

The condition has remained unchanged throughout his life and there is no familial incidence.

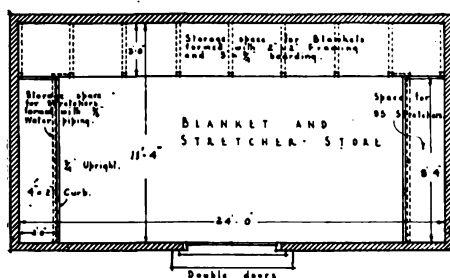
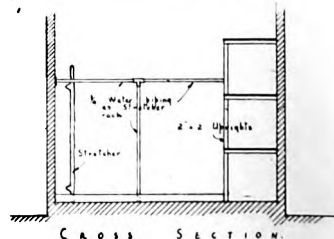
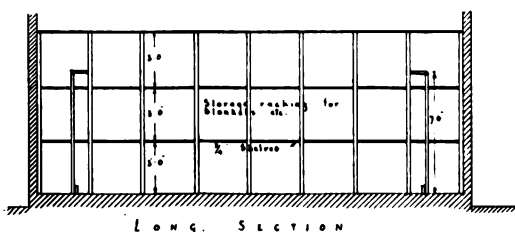
The interest in this case lies not so much in its comparative rarity as in the extensive distribution of the tumours.

A NOTE ON THE STORAGE OF BLANKETS AND STRETCHERS AND A SUGGESTED METHOD FOR EASIER AND NEATER PACKING.

BY CAPTAIN (Q.M.) F. DAVIS,
Royal Army Medical Corps.

THROUGHOUT a long experience it has been frequently, and sometimes painfully, brought home to me that blankets and stretchers—probably the most essential of all Corps equipment—can be very stubborn, awkward and untidy things if not kept within bounds.

It was, therefore, a pleasure to be asked by the Royal Engineers, some months ago, to make a drawing of the fittings necessary to make a small



BLANKET & STRETCHER
STORE
Designed by Capt F. Davis (Q.M.) R.A.M.C.

July 1900

Hut for Blanket and Stretcher Store.

and newly-built hut into a blanket and stretcher store, with emphasis on "efficiency with economy."

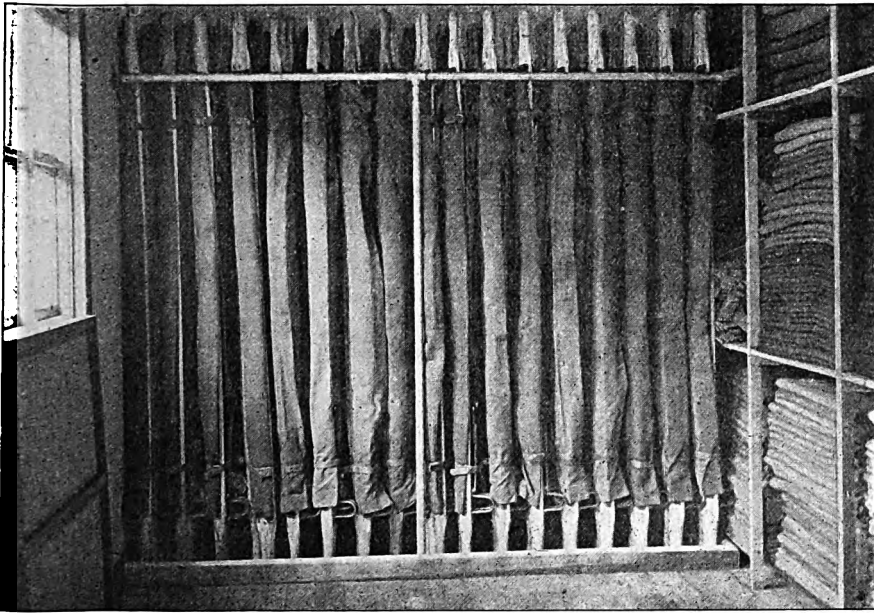
The hut was built with its length parallel to a road from which it was entered by double doors, and the internal measurements 24 by 11½ feet

gave 272 square feet of floor space. The numbers required to be stored were—blankets 500, and stretchers 170, together with slings and pillows.

To accommodate the blankets, pillows, and slings, a wooden rack 3 feet deep was built along the whole length on the side opposite the doors, the framework being of 2 by 2 inch material, forming 3 feet square bays with 2 floors of 5 inch by $\frac{3}{4}$ inch boards.

This proved to be quite strong and large enough for the purpose.

A stand for the stretchers occupying 2 by $8\frac{1}{2}$ feet floor space at each end of the hut was made with $\frac{3}{4}$ -inch bore galvanized water piping in the shape of a large T, $8\frac{1}{2}$ feet long and 7 feet high, and fixed with three socket bolts to rack, wall and floor, so that the top bars ran parallel to, and 2 feet from



Stand for Stretchers.

the end walls, the supporting bar being perpendicular from floor to upper bar. (The central fixing or formation being made with a "T" piece.)

A wooden curb 4 inches high and fixed to the floor to correspond with the cross bar above and "returned" to the side wall at its angle with the blanket rack completed the stand.

In each of these stands stretchers were placed upright five deep in 17 rows; in short, 85 stretchers in a floor space of sixteen and two-thirds square feet.

They are easily packed, and even more easily taken out, falling naturally on the shoulder in the carrying position.

Of the 272 square feet of floor space available, less than 110 square feet

was occupied ; this left ample room for a clerk's table and chair, and allowed for a party of men to file in and out for stretchers or for folding of blankets.

To extend the space for stretcher storage the rail and curb could be unscrewed and refixed where required, or better still, provide another rail and curb. For example, if a space of 6 by $8\frac{1}{2}$ feet were used at each end of the hut, 510 stretchers could be stored, and this would leave a free space of 12 by $8\frac{1}{2}$ feet in the centre of the hut to work in.

VACCINATION—TREATMENT OF ONE OF THE LATER COMPLICATIONS.

BY LIEUTENANT C. HACKNEY,
Royal Army Medical Corps.

IN the vaccination of large numbers of men, there is one complication which will be found to arise in a certain number of cases, i.e. the sloughing of the vaccinated area. This occurs after about a fortnight, and usually in cases which appear to have been getting on all right. The man gets a knock, the whole scab comes away with some necrotic material beneath, and a large raw area is left of about one inch in diameter and of varying depths. This raw area is difficult to heal, and the time usually taken for it to granulate and heal over cannot be spared from the short training time.

One satisfactory method of promoting healing is to treat the wound like the raw area left after a burn. Clean up the raw surface with spirit or ether methylated. Then spread a thick coating of Tannafax jelly over the raw area. Allow this to "tan" properly, then apply a protective gauze covering. This can be repeated the next day. The scab can be left until it comes off by itself, usually on the seventh to the ninth day, when it will be found that the whole area beneath is healed. This treatment has the additional advantage of allowing the man back to full duty after the second application of the "tanning" medium, thus saving valuable time in training.

Current Literature.

COHEN, S. M., and SCHULENBURG, C. A. R. Treatment of War Wounds of the Limbs. *Lancet*, September 21, 1940.

The cases represented a mixed group. Some were wounded in Belgium and France, some were casualties at sea, and the majority received their injuries on the sands at Dunkirk. All the cases had been wounded at least 24 hours before admission to hospital and the majority 40-72 hours previously. The authors treated 266 wounds of the extremities. They regard

treatment of the wound as important. General anæsthesia was usually employed; the routine use of evipan (limited to 10 c.c.), or pentothal, followed by gas and oxygen, was most satisfactory. The wound was covered with a saline swab and the surrounding skin cleaned with ether soap, shaved, and washed with saline. No antiseptics were employed in the wound. Frayed edges of the skin were excised with scissors, and the wound laid widely open by making several radial incisions. Radiating incisions were also made in the fascia. No attempt at trimming or excision of muscle was made; only loose fragments of bone were removed. No trimming or suturing of divided nerves was done. It was found unnecessary to lay through and through wounds widely open; by enlarging the entrance and exit wounds by radiating incisions of the skin and fascia the course of the wound could be readily packed with petroleum jelly. Foreign bodies were only removed if readily accessible. Large splinters were always removed, but no attempt was made to remove the small splinters some way from the wound, and probably embedded in muscle. The disruption caused by a large fragment left a blood-filled space which the entrance wound only partially drained. Counter openings were made so as to drain the lowest part of the cavity.

No antiseptics were used in the wound itself. Two inch gauze roll impregnated with petroleum jelly was used to pack the wound and the surrounding skin was covered with a thick layer applied with a spatula.

A thin layer of plaster wool was placed over the wound, plaster being then applied skin tight. Immobilization of the limb was obtained by immobilizing the joint above and below the injury. Several patients were admitted to hospital with large windows cut in the plaster. All these showed "window œdema," with congestion of the tissues and raised temperature. When placed in a closed case they were comfortable and the temperature subsided. For the application of the plaster a definite technique was devised. The smell from the plaster worried the other patients; pure dettol dropped on the outside of the plaster seemed to have the best effect, but its action is short lived.

All compound fractures were treated in closed plaster. Reduction was obtained by manual traction only. The authors were well satisfied with the alignment and the length of the limbs.

There were 207 wounds involving the soft tissues only and 20 of these were treated with plaster. Where plaster was not used immobilization was assisted by the application of elasto-plaster over the bandage. In lower limb injuries walking was not allowed. The healing of soft tissue wounds treated in plaster was astonishing.

After operation chemotherapy was employed as a routine, with standard dosage. Sulphanilamide was used but was not applied to the wound. Sulphapyridine was reserved for chest wounds.

Of the 266 gunshot wounds of the limbs, 84 were treated in plaster and 54 of these were compound fractures. There were 119 wounds of the upper

limbs and 147 of the lower. There were no deaths and amputation was required in only one case for secondary hæmorrhage from the popliteal artery.

No case developed tetanus or true gas gangrene. In 10 of the cases treated by closed suture before admission severe infection had already developed. The stitches were removed, the wounds widely opened; petroleum jelly packs were inserted. In spite of the severe sepsis they were treated by the closed method. All the cases did well. The authors state that their results show that even in late cases the closed plaster method is safe and satisfactory. At the end of ten weeks none of the patients was pyrexial, and the general condition was excellent.

Burns of the Hands and Face. *Lancet*, No. 23, 1940.

At a meeting of the Royal Society of Medicine it was decided that tannic acid should not be used for burns on the face, hands or feet. The tannic acid causes compression of the vessels in the fingers and toes, and leads to stiffening of the eyelids, which may expose the cornea. In the E.M.S. hospitals the application recommended is tulle gras¹; this consists of a curtain net with a 2 mm. mesh soaked in soft paraffin 98 parts, halibut oil 1 part, and balsam of Peru 1 part; it can be kept in tin boxes and applied directly to the burn. Saline packs can be applied outside it and the saline will penetrate the mesh. First-aid parties are advised to apply either tulle gras or plain sterile dressings.

It is understood that the R.A.F. and Navy propose to use collapsible tubes of a jelly containing 1 per cent of gentian violet and 0.02 per cent of merthiolate. There are objections to the general use of gentian violet. It is not easy to obtain and does form a coagulum, though a softer one than tannic acid. There is no objection to the use of tannic acid elsewhere on the body.

MCDONALD, R. The Ventilation of Ships. *J. Inst. Heating and Ventilating Engineers*. 1939, v. 7, 272-95.

The author of this article deals most fully with the important subject of ship ventilation and with the correlative problem of ship heating. The development of the modern passenger ship has created numerous problems for the ventilating engineer due to restriction and congestion on board ship and it is difficult to reconcile ventilation principles ashore with those afloat. Among the problems that arise may be mentioned the difficulty of accommodating ducts and pipes where high 'tween decks are not practicable; the finding of space to house ventilating fans and motors; the necessity for not obstructing with ventilating plant, ducts or cowls, the large areas of deck which are required for deck games and promenade space; and the

¹ Tulle gras (lumière), Anglo-French Drug Co. Nouad tulle. Allen and Hanburys.

placing of fresh air fans so as to avoid the spread of obnoxious smells from kitchens, engine rooms, etc.

At one time natural ventilation was all that was provided, even in vessels going to the Far East. Cowl ventilators were large and numerous and skylights and light and air skids were an essential part of the design, with perhaps the provision of rotating propeller fans. As for heating of rooms and corridors, steam radiators, or a continuous piping working at 50 pounds pressure per square inch was considered ideal. Though such conditions still exist on cargo vessels and coasters it is realized that mechanical ventilation should be employed.

It is interesting to note that while the Board of Trade are responsible for the comfort conditions of third-class passengers and crew, there are no rules as regards the ventilation and heating of accommodation provided for other classes of passengers. A third-class passenger is allowed a minimum of 15 square feet deck area and 830 cubic feet of air per hour by mechanical means, with an additional 33 per cent air supply if the accommodation is situated in the bowels of the vessel or adjacent to machinery spaces. In actual practice a figure of 1,000 cubic feet of air per hour per person is allowed as a minimum for third-class passengers and crew which, relative to the cube of the space occupied by the individual, ensures at least eight changes of air per hour. The amount of air supply is usually well above this minimum especially in vessels trading with the tropics.

An advance on the use of high pressure steam heated radiators and pipes was the development of mechanical ventilating systems, the supply fan units incorporating heater batteries and casings so designed to heat the air to the temperature desired in the rooms, *plus* the additional heating necessary to offset the losses through the exposed surfaces of the structure. Such losses are considerable, especially where a vessel encounters conditions approaching zero in the North Atlantic or Baltic, and it may be necessary for air to enter rooms at something approaching 90° to 100° F. to combat such losses. Such a system is, of course, entirely unsatisfactory and it is now realized that it is essential for the heating and ventilating systems to be separate in fact, but to operate together in principle.

Steam heating in modern ships is generally of the vacuum low pressure type, the pressure of steam not exceeding 5 pounds per square inch and the temperature rise being such that the system will be capable of maintaining a temperature of 65° to 70° F. Electric heating has come into more common use of recent years but is confined mainly to passengers' and officers' accommodation—the more simple and the less expensive method of continuous piping without radiators being preferred in crew spaces. Insulating the exposed walls and ceilings of living rooms and public rooms of vessels with 2-inches thick non-inflammable cork against excessive heat losses in winter conditions and heat gains in summer and tropical conditions is a sound investment.

The author discusses in some detail the methods of ventilation of the

various sections of a ship—crew accommodation, passenger accommodation, sanitary services, public rooms, dining saloons, kitchens and dependencies, cargo holds and stores, and machinery spaces—in all of which the ventilation systems are entirely separate though necessarily correlative.

A modern vessel may require anything from 100 to 200 ventilating fans and usually there is great difficulty in placing them to obtain best results without obstructing decks. Further, it is desirable for the motors of the fans to be arranged with the armature shafts in the fore and aft direction rather than athwart-ships to reduce the wear and tear on the commutator end of the motor and to minimize gyroscopic action. Centrifugal cased fans are usually employed because of their ability to handle large volumes of air at various water-gauge resistances with reasonable silence.

Higher air speeds are used by the ventilating engineer in determining the size of ducts in ship ventilation than would be tolerated ashore because of the limited space on board ship and because absolute silence is not of major importance. In main ducts velocities are within 1,200 to 2,000 feet per minute and in branches from 750 to 1,000 feet per minute. The outlets or inlets in rooms of the grating or grille type are designed, if possible, for a velocity of 300 to 500 feet per minute. Ducts are usually made of galvanized sheet steel and, because of the rapid tendency to corrosion due to the effect of salt air and moisture deposit, are of a stouter gauge than applies to ducts of equal size in land work. In vessels trading in the tropics it is considered essential to fit sumps or pockets with drain cocks to drain off the moisture of condensation. Ducts conveying warm air or cooled air are generally insulated with slab cork, magnesia, or asbestos, and where ducts pass through fireproof bulkheads a fire damper of stouter gauge is fitted in the duct on either side of the partition. The Board of Trade now prohibit the practice of allowing ducts to pass through watertight bulkheads or decks and this is one of the reasons why it is necessary to have so many fans on board ship.

Finally, the author makes reference to air conditioning which, though limited at present to a few of the larger vessels, is evidence of the interest now being taken to improve living conditions at sea.

This article is an excellent and detailed account of ship ventilation in all its aspects and a short review of this kind cannot deal with all the points mentioned. The article might usefully be read not only by those primarily interested in ship construction but also by those whose work and interests bring them in contact with ships and life afloat.

M. T. MORGAN.

Reprinted from "Bulletin of Hygiene," Vol. 15, No. 7.

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Reviews.

FIELD SURGERY IN TOTAL WARFARE. By Dr. D. W. Jolly, M.B., Ch.B., N.Z. Late Major, Spanish Republican Army Medical Service. London : Hamish Hamilton, Ltd. 1940. Pp. xiv + 242. Price 10s. 6d.

The publishers worked overtime to get this book out, and it will be surprising if there is not a second edition shortly. I have no hesitation in recommending it to surgeons in the Army, in particular. Those who had practical experience of surgery in the field, and who saw the difficulties which had to be met before the B.E.F. was evacuated from France and Belgium, will, I am sure, readily agree with the author that the keystone in the arch of medical organization in the Axis type of warfare is mobility ! Lieutenant Jolly, for he has been commissioned in the R.A.M.C. since his book was written, had an enviable experience in Spain, and his views will not only command attention, but be worthy of close study. To those readers who may be inclined to exclaim, " A pity this book was not published sooner ! " I would say that it would have made no difference to the Army medical units as seen with the B.E.F., because these had to be built up and mobilized long before the Spanish fighting indicated the ways of those who pin their faith on " total warfare " methods.

Do not fail to read the Foreword by Surgeon Rear-Admiral Gordon-Taylor. The distinguished Rear-Admiral was a surgical specialist in the Army in the Great War, where he learnt to appreciate the problems, and did much toward the common task of solving them.

Section I of the book is worth studying alone. The author describes the " three-point forward system " and the type of " mobile surgical unit " that was ultimately developed. It is now generally appreciated that the whole medical organization in warfare, where wounds and not sickness claim first place as a cause of wastage of man power, must be built round the surgeon as a nucleus, and that the time factor is of such importance that if the wounded man cannot be brought to the surgeon the surgeon must go to him. With air attack so important a factor, both situations demand small mobile units, easily hidden, not large fixed vulnerable units.

Section II deals with surgical technique. Dogmatic in places, it is nevertheless full of useful tips based on practical experience. Plaster technique is prominently featured.

D. C. M.

TEXTBOOK OF BACTERIOLOGY. Third edition. By R. W. Fairbrother, D.Sc., M.D., M.R.C.P., Major R.A.M.C. London : William Heinemann (Medical Books) Ltd. 1940. Pp. x + 451. Price 17s. 6d.

This is a very wisely designed book, written for the ordinary medical student. There are always certain students who delight in studying large

tomes or systems of reference and interesting themselves in difficult problems before they have mastered the essential principles of a subject. These may be disappointed in this volume. But for the average hard-worked medical student who wishes to digest a complete introduction to bacteriology, Major Fairbrother has produced one of the best books on the subject.

The layout is not altogether orthodox, but the arrangement adopted by the author has many advantages. The body of the book is practically free from detailed technique and formulæ of media and stains. These are included in a short appendix. There is a pleasing absence of any reference to protozoology, which so frequently creeps into textbooks on bacteriology, and it is so attractively written that the average reader should find no difficulty in studying the book without any effort. This revised edition contains references to most of the recent work suitable for inclusion in a publication of this nature. The only criticism that one can make is that the author is, on occasions, not sufficiently clear in his statements for the inexperienced. For instance, in discussing post-nasal swabbing in the control of cerebrospinal fever (a subject concerning which there is considerable confusion in the minds of many medical practitioners) a more dogmatic statement on the failure of isolation of carriers, as a practical measure, to control the incidence of the disease would have been welcome. Again, in describing the antigenic complexity of the mannite-fermenting dysentery organisms, either an accurate statement of Boyd's classical work should have been given or a much simpler account would have sufficed. The student will find it difficult to appreciate the true relationship of this group of organisms from the description given. These are perhaps small faults to find with a book that is otherwise so generally sound.

The difficulties of the student may be appreciated with long experience of individual teaching, but it is another matter to make all these points clear in writing. The author is to be congratulated on this most excellent book; it can be recommended with confidence to all medical students.

H. J. B.

SURGERY OF THE HAND. By R. M. Handfield-Jones, *M.C., M.S., F.R.C.S.*
Edinburgh: E. & S. Livingstone. 1940. Pp. viii + 140, 95 illustrations (many coloured). Price 15s.

The author in his preface makes the following statements: "I feel that even now the grave implications of infections of the hand do not receive the attention to which they are entitled. Too often they are dismissed as trivialities of minor surgery. . . ." "It is because so many serious infections have trivial beginnings and are allowed to develop by delay in diagnosis and imperfection of treatment that it seems good to put these matters in simple language and in practical detail devoid of unnecessary theory." The former statement is, alas! a reproach which the profession

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—*British Medical Journal*, May 15, 1937, p. 1013.

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still merits, and the latter is ample justification for another treatise on the subject. Mr. Handfield-Jones has done the job well: his points are well illustrated, with excellent semi-diagrammatic pictures and well-reproduced photographs.

This book is strongly recommended, and attention is invited in particular to the author's remarks on after-treatment. "No skill can restore function to a hand deformed and rigid from the effects of delayed diagnosis and inept treatment. But, ill-conceived after-treatment can render useless a hand in which prompt diagnosis and efficient treatment had laid the foundations of complete recovery."

D. C. M.

THE CONQUEST OF BACTERIA. From 606 to 693. By F. Sherwood Taylor, Ph.D., M.A., B.Sc. London: Secker and Warburg. 1940. Pp. xiii + 144. Price 6s. net.

Following a brief general account of the causative agents of infectious disease and various immunological problems in semi-popular language, the author passes on to the development of synthetic drugs and the rise of chemotherapy in the treatment of bacterial and protozoal diseases.

Adequate tribute is paid to the father of chemotherapy, Paul Ehrlich, but the author is hardly fair to Schulemann and his fellow workers who produced plasmoquine and atebrin, preparations that have been used for the successful treatment of thousands of cases of malaria. The synthesis of these drugs, commencing with methylene blue, remains one of the most interesting examples of substitution chemistry.

Almost half the book is devoted to the sulphonamide drugs derived from another dye, chrysoidin. The amazing activity, as a bacteriostatic, of sulphapyridine, a member of this group, and the publicity given to it in the popular press are perhaps responsible for this lack of balance. It must be remembered that these sulphonamide derivatives are of recent introduction, and it well may be that more potent and less unpleasant preparations will replace sulphapyridine in the future. Already sulphathiazole has been shown to be at least the equal of sulphapyridine in treating some infections and free from some of the unpleasant effects of the latter drug.

The book is full of interest and readable, but it is to be wondered if the atomic patterns and graphic formulæ will be appreciated by readers who have not had a grounding in organic chemistry.

H. J. B.

A HANDBOOK OF MALARIA CONTROL. By R. Svensson, D.S.O., M.C., M.B., B.Ch., with a Foreword by Sir Malcolm Watson, LL.D., M.D., C.M., D.P.H., F.R.F.P.S. Published by the Shell Oil Companies.

A most valuable little book intended primarily for the use of planters, engineers and other laymen, who have to undertake anti-malarial work

in the tropics, but nevertheless a useful little handbook for the medical man as well.

The author has done his work well and, while leaving the reader in no doubt as to the tremendous importance of anti-malarial measures, presents the essential features of such work in a thoroughly practical and interesting way.

The anopheline vector and important points in regard to its life-history are discussed while in an appendix useful notes are available on the various carrier species in the different regions in which malaria occurs.

Similarly, information is given in appendices as to considerations of moment in regard to the collection and maintenance of adult mosquitoes and their identification and dissection, as also the collection, rearing and breeding out of larvæ. Minimum necessities as regard laboratory equipment are described, while the precipitin test and humidity are simply dealt with.

In the main body of the book the question of control of mosquitoes and malaria is most adequately considered and all the various methods are well and simply described.

Natural means of control of breeding receive their full meed of attention, as also do the various aspects of the drainage problem, the latter being clarified with the aid of some excellent diagrams.

Finally, the important features of oiling and the use of Paris green are fully discussed.

The book is a most welcome addition to the literature on malaria prevention, and must prove of considerable value to the many laymen who have to do their best to grapple with the problem as best they can, often without technical assistance.

As already stated, the book is designed primarily for the layman, and has perhaps exceeded its duties to some extent when space is given to such matters as the precipitin test, dissection of mosquitoes and the like, but with the tucking away of these in appendices honour is served, and the average layman does not find the issue fogged with technical detail as to laboratory work which he may find it difficult to understand.

The book is most confidently recommended to all interested in anti-malarial work, whether medical men or not.

Note.—The Shell Group of Oil Companies generously defrayed the cost of the first impression of this handbook. To facilitate distribution overseas and to avoid duplication, the principal offices of the Associated Companies of the Shell Group hold stocks, and copies may be obtained from them. As regards the British Isles, application should be made to the Organizing Secretary, 7, Ross Institute of Tropical Hygiene, Keppel Street, Gower Street, London, W.C.1.



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GUILD NOTES.

THE following is a short summary of the Guild's activities since the December number of the *Journal*.

At the end of December we had banked £1,165 2s. 6d. Our expenditure up to the same date amounted to £406 9s. The latter includes the £100, which was sent to the Red Cross Fund for Prisoners of War. The letter acknowledging the cheque ran as follows :—

"Unfortunately, as all parcels are addressed to the British Camp Captains for distribution to the prisoners it would not be possible to slip in a note saying that the parcel comes from the R.A.M.C. and A.D. Corps Comforts Guild. We would, however, be glad to write to a member of the Corps in each camp telling him that his parcels were subscribed by the Guild and asking him to inform any fellow members of the Corps who may be in the same camp."

We have written asking for this to be done.

We have received many grateful letters, including two from the Orkneys and Faroes. Here is a quotation from a letter we received from Scotland. "Up here in the 'frozen North' our N.C.O.s and men have a pretty thin time in many cases, as they are in isolated spots, and don't even have the chance of the occasional visit to a cinema; so both the woollies and games will be a perfect godsend to them."

Our general plan is to serve the more isolated places first, and with this end in view, parcels have been sent both to R.A.M.C. and A.D. Corps personnel in Scotland, the north and east coasts, and to the Anti-Aircraft Divisions. After that it is difficult to know where to start, so we have sent where we think the men will be most exposed and lonely.

We could do much more if we had more woollies and it is hoped that after the need has fallen off this winter, which will not be for another two months, we shall be able to collect a large stock during the spring and summer.

Books, games and playing cards are in great demand. We buy most of them, but we should be most grateful for any that could be sent to us.

Any units who can start knitting parties can be supplied with wool by the Guild, if they will apply to Lady MacArthur, Mrs. Clewer, or to the Honorary Secretary, Mrs. Garraway at the Headquarters Mess, Millbank, S.W.1.

We want to emphasize that our need for funds increases as the R.A.M.C. and A.D. Corps continue to expand.

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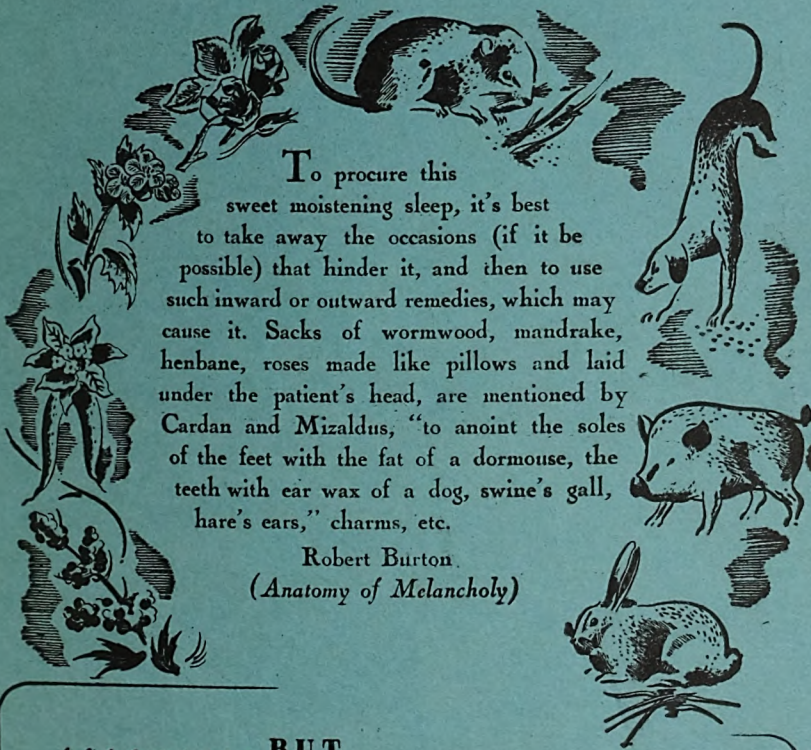
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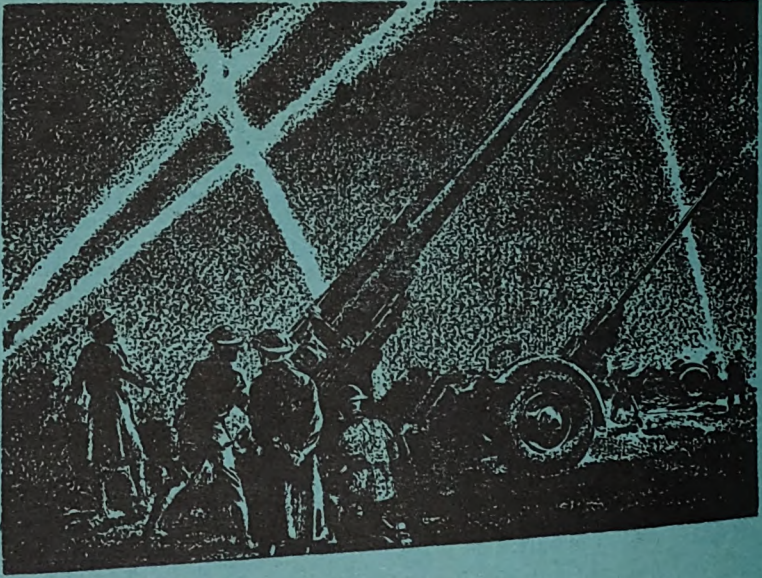
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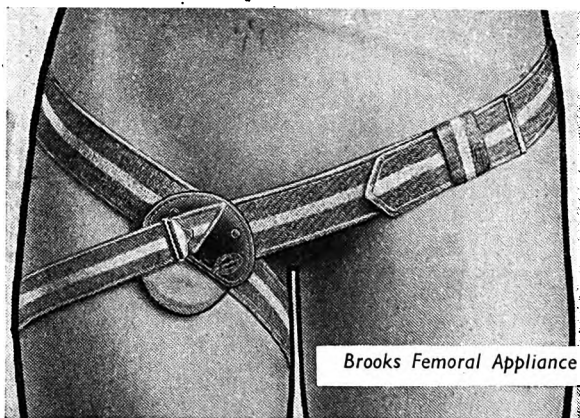
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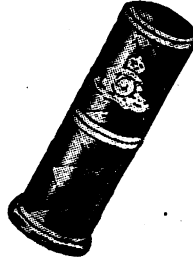
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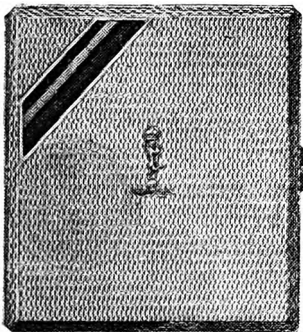
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NOTES ON THE MEDICAL SERVICES OF A DIVISION.

BY COLONEL J. C. DOWSE, M.C.

THE following notes have been compiled from the experiences gained on active service and practical exercises. They are the collected impressions of many medical officers, field ambulance commanders and others.

They do not pretend to answer all the questions that arise in dealing with the collection and evacuation of casualties from the forward area but, if any of the suggestions found in the notes help those who have to organize field medical units or work in these units, their object will have been attained.

Where at times the theories advanced seem to stray from accepted ideas, it can only be said that an all too short experience of the "real stuff" did not tend to show that these theories were impracticable. On the contrary, *experientia docet*, and that experience all points to the conclusion that rapidity of evacuation of the casualty is of major importance and further, that this can only be accomplished, in these days of mechanization, if the field medical units are given motor ambulance vehicles in much larger quantities than at present allowed in war establishments.

(1) *The Rôle of the Field Ambulance in Mobile Warfare.*

It may be taken as an axiomatic truth that a unit not essentially mobile by virtue of its war establishment transport, cannot become mobile under war conditions.

The construction of the field ambulances that went to France with the B.E.F. was not essentially mobile. It was not possible, without overloading the vehicles, to carry all the equipment and the personnel at one and the same time in the unit transport.

The field ambulances of the division to which I was attached did make several long "marches," and were able to make the journey in one trip, but the vehicles suffered and there was an undue proportion of mechanical breakdowns in consequence.

These breakdowns, caused almost entirely by the constant overloading of the vehicles, occurred before the war was many weeks old; one can easily imagine the state of the transport after six months or more of real mobile warfare.

The Unit Transport Officer is constantly faced with the problem of getting a bad mark from the Commanding Officer for refusing to let his vehicle carry more weight than that for which it was designed or for submitting to the inevitable and finding broken springs and over-heated engines in excessive quantities.

The Commanding Officer, on the other hand, while fully realizing that the Transport Officer is right, feels that he must get his personnel to the end of the journey in good time and in fresh condition, if they are to play their part in the evacuation of the wounded to the credit of their unit and their Corps.

I make bold to state that no soldier in the division requires to be fitter or fresher for his work than the stretcher bearer. He cannot carry loaded stretchers for long hours after a hot and sweaty march.

The suggestion that the field ambulance can make its trip in two bounds by sending back transport to pick up the "non-carried" personnel is, quite definitely, outside practical politics in actual warfare. An attempt to do this on two occasions meant that the unit concerned became completely immobile and was unable to get into position with the necessary gear and personnel for six hours in one case and eight in another.

The pernicious habit of carrying R.A.M.C. personnel in the motor ambulance cars should never be permitted. The ambulance cars must always be available for their proper function, particularly when the danger of air attack is likely to cause casualties on the line of march.

The Water Cart Trailer.

The water cart trailer is not a good piece of equipment for a field ambulance.

The trailers have to be pulled by the lorries of the unit, if the water cart trailer has to be filled from a water source at some distance from the location of the unit, as frequently happened on active service. One of two things had to occur—either the tractor lorry had to take the trailer, having been emptied of its load of personnel and equipment, or move fully loaded, fill the water trailer, and then come back to its location. In the first instance the lorry's contents were immobilized until the lorry returned and in the second the personnel and equipment were useless until their return. In either case a great loss of efficiency and time resulted.

Field ambulances should be equipped with the self-propelled water

cart. Under active conditions field ambulances use a great deal of water. The water trailers were in constant use.

Apart from these considerations any form of trailer is unsound in a mobile column otherwise composed of non-trailer vehicles. The trailer cannot be backed for any distance. Vehicles pulling trailers are very often the cause of a "hold up" on the line of march when they over-shoot their turnings. It is refreshing to hear the gunners on this subject; the answer to their problem is perhaps not quite so easy!

(2) *Medical Arrangements on the Line of March.*

The constant possibility of air attack and casualties therefrom, combined with the necessity for rapid deployment on the conclusion of the march, has made it essential to modify the position of the field ambulance personnel in line of march.

The usual position for the field ambulance whilst *en route* with a brigade is in the rear of the brigade group. A brigade on the road may well stretch for 20 miles or more. The head of the column may reach the debussing point or the assembly area before the field ambulance has left its billet, a difference in time of possibly four hours. It follows, therefore, that some portion of the medical unit *must* be with the leading troops, so that, as they deploy and engage the enemy, there may be medical aid available at once. Further, whilst on the march, casualties may occur from bombing. Arrangements need to be made so that casualties of this nature may be dealt with immediately.

The following scheme is a suggestion to meet these altered conditions. It has the advantage of having been tried out in its main features in actual warfare and has shown that it is a workable proposition. Naturally, modifications will have to be made to meet particular conditions.

One company of the field ambulance should move in the rear of the leading battalion of the brigade group. This company will remain with the leading battalion until the debussing point or the assembly area is reached and it will then be available to open an A.D.S. immediately. In addition to the normal transport it will have two motor ambulance cars attached.

For every ten miles of a route to be covered, one field ambulance medical officer and two nursing orderlies with a small quantity of medical equipment, e.g. splints and shell dressings, together with the officer's car and one motor ambulance car, will also accompany the leading battalion. Shortage of M.O.s may make it necessary for an N.C.O. to be in charge of one or more of these posts.

This medical officer, or N.C.O., will fall out of the column when the ten mile stage is reached and form an aid post or collecting post. The position of the post or posts will be determined on the map *before* the march starts and will be noted in the brigade operation order for the march.

The medical officers or N.C.O.s detailed to form the aid posts on the route

should not be found from the company forming the advanced party, but from the remainder of the field ambulance.

The intention of these posts on the line of march is that at no time should the marching or bussing troops be further from an aid post than five miles. The R.M.O.s will show that they have a point in each ten mile section of the route to which cases can be sent or from which assistance can be obtained. The R.M.O. can attend to his casualties, hand them over to the aid post, and rejoin his unit with the minimum of delay.

In order that the scheme may work smoothly, it is essential that brigade staffs fully understand the idea and make the necessary provision in their march tables for the field ambulance detachments. The locations of the posts must be notified in the orders for the march.

The main body of the field ambulance can move in the rear of the column. The personnel of the aid posts can rejoin the main body as that unit passes them.

(3) *A Standing Order for Field Ambulances.*

On receipt of orders for a march, a field ambulance commander will send one motor ambulance car to each battalion and field regiment, R.A., in his brigade group. This ambulance car will accompany the unit to the end of the march and will then be returned to the field ambulance *at once*.

If the march is to end with the deployment of the troops and an attack on the enemy, one stretcher squad of four stretcher bearers will also be sent to each battalion and field regiment. These stretcher squads form the first link between the R.A.P. and the A.D.S.

NOTE.—It is suggested that every unit that carries a medical officer on its establishment should have one motor ambulance car (light type) on its permanent establishment, in addition to the medical officer's truck. The need of such a vehicle is constantly felt by R.M.O.s whether on active operations or under "peace" conditions.

(4) *The Evacuation of Casualties from a Rapidly Changing Front.*

As soon as the leading battalions debus and deploy, contact with the enemy may be very rapid. Casualties occur possibly before the field ambulance has had a chance to establish an A.D.S.

The R.M.O. can only collect his casualties and "dump" them until he is in contact with the field ambulance behind him.

The battalion may be making rapid moves forward with which it is well-nigh impossible for the R.M.O. to keep pace.

In all such moves the battalion commander must decide on the probable line of evacuation of his casualties, so that his M.O., having dealt with the initial casualties, may be able to move his R.A.P. forward in the general line of the advance and contact the casualties as he goes forward. This information should be given to company commanders so that they, in turn, know what rearward routes they should direct their casualties along. The company stretcher bearers should carry their stretcher cases towards this route, once again making dumps to facilitate the eventual evacuation of these cases.

In the meantime, the field ambulance will have been able to contact the R.M.O. and will have commenced, by means of car posts and the stretcher bearers, to empty the successive R.A.P. locations. In some instances it may be possible for the ambulance cars to collect from beyond an established R.A.P. *when the situation forward permits*. Close co-operation between the R.M.O. and the field ambulance bearer officer is always necessary. In theory, the field ambulance is responsible for emptying the R.A.P. only, but their main function is to clear the front of casualties by the most rapid and effective means.

Company commanders must assist in the evacuation of casualties by making use of any form of transport that is available—returning ammunition lorries, supply lorries, civil carts and lorries, etc.

Messages from brigade headquarters, battalions, R.M.O.s, etc., asking for assistance and the clearance of wounded, should always be addressed to the A.D.S. serving that particular bit of the front.

The message should be sent by prefixing the letters A.D.S. to the code name of the ambulance forming it. "G" say that it is very unlikely that any messages will be sent to the A.D.S. by wireless and that this prefix will not give information away to the enemy. It would be better if each field ambulance had its code name and that a second code name was given to each unit for the A.D.S.

The field ambulance in this type of rapid movement forward must have a very "fluid" A.D.S. It is in reality merely a car post where cases are collected. As a rule the field ambulance commander will have eight cars at his disposal. Of these eight he will have four working between the R.A.P.s and the A.D.S. and the remainder from the A.D.S. to the M.D.S.

The tendency should be for the A.D.S. to be pushed as far forward as possible, the intention being to reduce the distance from the A.D.S. to the R.A.P. The A.D.M.S. will have a few cars up his sleeve for emergency and may be able to reinforce an A.D.S. that is having a heavy time. As a rule one brigade will be in reserve and not using all the cars in the field ambulance with that brigade, these cars forming a divisional pool.

(5) *Evacuation of Casualties from the Front Line in Defensive Warfare.*

The modern idea of "defence in depth" has brought many problems in the method of evacuating casualties.

The "dispersal" principle has added to these problems.

The regimental medical officer now has to think of methods by which he can get casualties from a number of more or less isolated points back to his R.A.P. He must site his R.A.P. so that it will be as central to the battalion defence area as possible. At the same time he must remember that his R.A.P. should itself be a dispersed area, well hidden from air observation and avoiding any collection of individuals in one spot.

Two facts arise from these basic principles.

It has been proved that it is very difficult to remove casualties from

isolated defensive posts during the daytime. There are no communication trenches down which casualties can be carried.

By careful use of dead ground in the rear of some of the posts it was possible to get the more lightly wounded away during the day.

Definite plans must be made so that the occupants of the posts will know the line of evacuation for their wounded, whilst the regimental stretcher bearers need to be well trained in the routes that they will use at night to get their cases away. These routes should be well sign-boarded whenever possible.

The defensive posts should be equipped with a number of shell dressings, etc., so that the occupants can render first aid to their wounded whilst they await removal to the R.A.P.

The number of stretcher bearers in a unit rarely permits the possibility of staffing all the posts with stretcher bearers. It is one of the necessities of this type of warfare that the wounded must wait to be removed till a suitable opportunity presents itself. Unless they can make their own way back and/or the regimental stretcher bearers can reach them they must remain where they are. This implies that a much larger number of men per battalion require to have training in first aid. Modern warfare is surely becoming one of "robots" and not human beings! The companies should have their complement of stretcher bearers with them. The bearers should be distributed as the company commander thinks fit, the R.M.O. retaining a small portion so that he can reinforce the companies as he considers best.

Reinforcements for Stretcher Bearers.

These can be obtained :—

- (i) From the reserve that the R.M.O. should hold with him at the R.A.P.
- (ii) By utilizing prisoners of war.
- (iii) By arrangements with the commanding officer to have a certain number of men in the reserve company earmarked for this purpose.
- (iv) By men from the company itself. This is not a sound method; active "rifles" should not be employed to carry wounded back, as the company cannot afford to lose men in this fashion. Besides it opens up means of excuse for absence from the line.

At the same time it must be borne in mind that regimental stretcher bearers are there to carry stretchers; the general line of training must be that stretcher bearers must be prepared to bring the casualties back to selected points where the cars can reach them and not expect ambulance cars to come right up to the casualty.

The dispersal theory must not be carried to extremes. A medical officer, like any other individual, can only be in one place at one time, and that place is his R.A.P. "treatment zone."

The R.M.O. must therefore train his personnel so that they can arrange

the R.A.P. area layout without the necessity for his personal supervision of the reception, treatment and evacuation zones of the dispersed R.A.P. Naturally the original siting of these zones is his duty. Once sited, his place is in the treatment zones and his staff organize the intake and regulate the flow of cases to the treatment zone and from thence to the evacuation zone where they are taken over by the field ambulance personnel.

In this connection the regimental padre can be of immense help in assisting the M.O. in organizing the R.A.P., clerking the wounded, supervising evacuation, etc.

Casualties, once they reach the R.A.P., are the responsibility of the field ambulance for further evacuation.

Whether the casualties can be removed by daylight will depend on the tactical situation. In general, the R.A.P. will be sited in such a position that movement to the rear should be reasonably safe.

The enemy should not be given credit for more than ordinary powers of observation and, therefore, if the exit routes are free from directly observed machine gun and rifle fire, small parties of stretcher bearers can move backwards with their casualties until they reach a point to which it is possible to get an ambulance car, i.e. the first car relay post on the line of evacuation.

The main principle in this evacuation scheme is that the ambulance cars should be pushed up as near the R.A.P. as possible, consistent with reasonable safety to the motor vehicle. The more the carry can be reduced the better for the patient and the more the energies of the field ambulance stretcher bearers can be conserved. Full use will be made of the wheeled stretcher carriers. Day and night sites for the car posts may have to be chosen. It is often easy to bring a car quite close to the R.A.P. at night whilst it is impossible to do so by day.

When it is not possible to bring cars within a reasonable distance of the R.A.P. it is well for the field ambulance commanders to recognize the fact that they must have their bearer relay posts well organized, so that there is a constant change over of the bearers. A definite routine should be established to ensure that no squad is on duty for more than four to five hours without a period of rest and the chance to get food and sleep. When the men recognize that they have four hours of real hard work and then a period of rest they will be able to give of their best for the whole time that they are "on the job." In arranging these reliefs the squad that has been sent to the R.A.P. as the first link must not be forgotten; these men most often have the hardest time, with the longest and most difficult carry.

This change over of personnel applies equally to the R.A.S.C. drivers of the ambulance cars. Reliefs should be arranged for these drivers so that a man is not expected to drive at night after a long spell just before dusk. Night driving in the forward area is a great strain. A tired man will lose his way, ditch his machine and make other mistakes much more readily than if he comes to the job fresh and well fed.

There is sometimes a tendency to regard a motor ambulance car as a piece of mechanism that should be in perpetual motion and for the human element, with its limitations, to be overlooked.

The R.A.S.C. driver is a gallant fellow, willing to carry on till he drops with fatigue. It is the transport officer's job to see that he gets reasonable rest and food. *N.B.*—Don't forget to include the D.P.s in the list of reliefs. It is perhaps a pity that the war establishments do not carry a larger proportion of spare drivers and motor cyclists.

The casualty having reached the car post arrives at the A.D.S.

The siting of this medical post is usually done by the field ambulance commander in consultation with the brigade staff. In this matter the field ambulance commander is the expert and the adviser of the brigade commander. The A.D.S. must be sited to fit in with the tactical scheme of the brigade commander, but arbitrary locations should not be made by the brigade commander.

It often happens that a location suitable for an A.D.S. is also ideal for a battery gun emplacement. Both units require similar terrain and considerable tact is required on the part of the field ambulance commander when suggesting that he should be given a particular bit of the Brigade front in which to open his A.D.S. A working arrangement might be that, unless the tactical situation is such as to make it imperative for the gunners to have a particular location, whoever first makes the reconnaissance and claims the site might be permitted to take possession! The decision naturally lies with the brigade commander.

There was a tendency during the recent operations in Belgium and France to locate the A.D.S. too far back; this may have been accounted for by the fact that the divisional front was so "fluid" that to place the A.D.S. in reasonable reach of the R.A.P.s involved constant moves.

With the present equipment in normal fighting and certainly in defensive positions, the A.D.S. not to be lightly permitted to fall into enemy hands, should be as far forward as possible. It is difficult to fulfil this condition out of the range of field gunfire and yet perform the function of an A.D.S. in a satisfactory manner.

The main reason why the A.D.S. must get up as near the front as possible is that the field ambulance is equipped with but eight motor ambulance cars. It is difficult to maintain an adequate shuttle system in the forward car posts if the run from the R.A.P. to the A.D.S. is made longer than is absolutely necessary.

Given a larger number of ambulance cars it would be possible to increase the distance between these two posts and at the same time to maintain a rapid evacuation of the casualties.

This theory at once opens up the burning question of rapidity of evacuation. It is obvious that the speed of evacuation of casualties from one point to another will depend, directly, on the number of vehicles available to transport the cases. The faster a wounded man can be transported

from the moment he receives his injury to the time that he comes under adequate medical attention at a C.C.S. the better for him. Every stop that he has to make, once he is in a motor vehicle, reduces the "safety" period for his wound.

The ideal, therefore, is that he should be collected in a motor vehicle as near the R.A.P. as possible, taken to a medical post where rapid first aid can be given, and from there sent direct to the C.C.S., i.e. cutting out one of the present posts, either the A.D.S. or the M.D.S.

The ideal can only be attained if the number of ambulance cars in a division is considerably increased and the whole composition of the field ambulance modified to meet the altered conditions. An article on this question appeared in the June, 1939, number of the JOURNAL OF THE ROYAL ARMY MEDICAL CORPS, under the title "Mechanization and the Modern Field Ambulance."

Under the present system and formation of a field ambulance, little can be done to arrive at this more satisfactory state of affairs, but the addition of more light cars and motor cycle carriers would go a long way towards increasing the speed of collection and evacuation.

There can be little doubt that the experience gained in the fighting across the "pond" demonstrated the fact that there are too many delays getting a wounded man back to the C.C.S.

All that is required is that there should be but *one* "sorting" office in the divisional area where first aid can be given to the wounded man after he leaves the R.A.P.; whether this place is called an A.D.S. or an M.D.S. is quite immaterial. The casualty should not be moved in and out of two cars before he is sent on his final trip to the C.C.S.

This "heresy" requires the alteration in the formation of the field ambulance mentioned above and a certain amount of reorganization in the function and method of employment of other units, notably the M.A.C.; this unit will have to come right up to the field medical post where the small vehicles are unloaded, i.e. rather nearer the line than is the custom at present.

In short, the system of evacuation would be: numbers of small cars and motor-cycle carriers collecting cases from as near the R.A.P.s as possible by means of car relay posts; these light vehicles to carry directly back to an A.D.S. or M.D.S. (what is there in a name?) there to be unloaded and the casualties vetted to determine if they are fit to move on at once. If they are, they will be put into the larger cars and sent direct to the C.C.S.

(6) *Evacuation of Casualties from the Divisional Area.*

It is the responsibility of the M.A.C. to clear the casualties from the divisional area. This is usually the M.D.S.

The following method was tried out in France and seems to have a number of advantages:—

The O.C. M.A.C. on instructions from the D.D.M.S. Corps arranges that the M.D.S. has a number of cars stationed by it, say four to six.

The evacuation route to the C.C.S. is decided upon and along this route, at suitable intervals, M.A.C. car relay posts are established.

As a loaded ambulance car leaves the M.D.S. and passes the first relay post an empty car is sent to replace it; this procedure is followed down the series of relay posts.

The car with the cases arrives at the C.C.S., delivers its load and joins the main pool of cars in the headquarters of the M.A.C. From this pool another car is sent to the first upward relay post and so the cycle commences again. The main advantage of having a shuttle system of this nature is that the driver, having arrived at the headquarters of his unit, can have some rest and food, fill up with petrol, etc., and be ready to take his turn again in the shuttle, or a spare driver can be put on the car. It should be rare for any one driver to have more than one or at most two long trips to do in the twenty-four hours. In addition, the supply of cars to the M.D.S. will be constant and at a rate that does not block the available space at the M.D.S. for hiding the vehicles. This is quite a point in this aerial type of warfare.

Once organized, the O.C. M.A.C. knows that he has cars reporting to the M.D.S. as they are required, thus doing away with the necessity of a constant stream of messages between the field ambulance and M.A.C.

The number of cars which form a "unit" in the shuttle system can be adjusted to meet the requirements of the situation within the capabilities of the M.A.C.

(7) Equipment Carried in each Motor Ambulance Car.

In addition to the normal equipment of stretchers, blankets, pillows and Thomas' splints, each ambulance car should carry one urinal, one bed pan, drinking mug and one bowl (a wounded man frequently vomits).

The M.T. dressing box is a useful adjunct. The compartment on the rear upper near side of the ambulance car is presumably intended to carry a bed pan and urinal but the inside container will not hold the normal model of bed pan as issued in the G 1098 equipment of a field ambulance. In any case, the bed pans and urinals at present held by the field ambulances do not permit of each ambulance car being equipped with these articles. Special indents must be submitted so that the eight cars can have their own equipment of this nature.

(8) Maintenance of M.A.C. Cars and Personnel.

Obviously this is the responsibility of the O.C. M.A.C. At the same time, in practice, several little points came to light that require definite attention. The feeding of the M.A.C. personnel who come to the M.D.S. frequently devolves on the field ambulance, as it is not possible for these men to get adequate food with their own unit until they arrive back at their

headquarters. This can usually be done as the field ambulance can get extra rations or a definite number of the M.A.C. personnel can be taken on the ration strength of the field ambulance.

Petrol and oil on the other hand is a different matter. Considerable care has to be taken to ensure that all the M.A.C. cars come *well* supplied with petrol and oil. It is hard for the quartermaster of the field ambulance and the unit transport officer to lay in a sufficient stock to meet more than their own requirements. Shortage in the M.A.C. cars very rarely occurred, but when it did, it was at very inopportune moments and was probably due to the fact that, in the retreat, the M.A.C. cars were a long way from their headquarters and from any means of replenishment.

(9) *Liaison.*

The immense importance of maintaining efficient liaison between the Medical Services and other branches of the Army cannot be too much stressed.

It is accepted that the Medical Services are largely an "A" concern. The A.D.M.S. deals almost exclusively with that branch. It is too often forgotten that when fighting commences the "forward" work of the field ambulances becomes of "G" interest to that officer.

The position of the A.D.M.S. is somewhat peculiar. He is not only the medical administrative officer for the division, but he is also commander of the R.A.M.C. units in the division.

It is just as important for the A.D.M.S. to know the tactical situation as it is for a brigade commander or a battalion commander, so that he may be in a position to make his dispositions to fit in with the tactical scheme. Immediate information of this nature can best be supplied by "G" staff.

Accurate and early news of the changes in the tactical situation is a *sine qua non* for efficient evacuation of casualties from the forward area.

This principle maintains from divisional headquarters to the battalion itself.

To put this principle into practice, battalion commanders, brigade commanders and the divisional staff should be constantly reminded of the necessity of maintaining liaison between themselves and the Medical Services.

Nobody realizes more than the medical liaison officer that a busy G.I. or brigade major may have little time to spare to give him all the information that he would like, but if the liaison officer is automatically included in all "G" conferences during active operations the necessity for constant "botherings" for information will largely disappear.

To elaborate a little more. The R.M.O. being the first link in the chain of the Medical Services must maintain constant touch with his battalion commander. It is also "up to" the battalion commander to see that his medical officer is informed of any change in the tactical situation as it affects the battalion. On several occasions, for instance, in the recent fighting

in France and Belgium, battalion headquarters moved to a new location, when, much to the surprise of the medical officer, he found that he had lost touch as he had not been told of the move.

This type of situation could be avoided if it were a regimental custom for the medical officer to have a runner, permanently posted to battalion headquarters, with no other duty than to carry messages between the battalion commander and his medical officer. This would form the first link in the liaison chain.

Passing to the field ambulance, one finds that the same situation is likely to occur.

Practically the only source of reliable information that the officer in charge of the A.D.S. can tap is to be found at the brigade headquarters. Here he will get news of changes on the brigade front, that this or that battalion is having a bad time, that casualties are greater on this flank or that, etc.

In order that this information may reach the field ambulance in time to be of use it is necessary for one of the field ambulance officers to be attached to the brigade headquarters, there to act as liaison officer. This may sound a waste of an officer, but in practice it is not so, as this officer can supply such a quantity of useful information that he fulfils an important duty if he does nothing else at all. The dental officer, who can do but little dental work in active operations, may make a very good liaison officer.

On the occasions on which communications broke down it was found that this principle of having a liaison officer constantly with the brigade had not been put into practice. In a war of movement this liaison must be closer than when static warfare is the order of the day.

The liaison link moves backwards to the divisional headquarters. Here one finds the A.D.M.S. on friendly terms with the A. and Q., getting information from him as to the administrative side of the division. Administration in times of "peace" forms the greater part of the work of the A.D.M.S.

One day comes the news that the division is to get on with the job of fighting. It is then that the A.D.M.S. has to divide his office into two parts, one to continue the administration and the other to tackle the "G" problems which now commence to assert themselves.

During times of "peace," "M" branch has little to do with "G," but the moment operations start the "G" side looms large on the medical horizon. Immediate information is required as to what the divisional commander intends to do. The A.D.M.S. must, therefore, be present at the "G" Conference. His D.A.D.M.S. represents him at the A. & Q. table.

It is on the result of this "G" conference that the A.D.M.S. is able to formulate his plans for the disposition of the medical units. Sometimes the conference is the preliminary one held by the commander himself. Here again it is essential for the A.D.M.S. to be present as the commander will want to know the main scheme of the medical arrangement, for nowadays

the medical picture rightly occupies a prominent place in the tactical schemes of any formation.

The A.D.M.S. finds out from the conference the estimated casualties, where these casualties may be likely to occur, which brigade will bear the brunt of the initial fighting, which is to be in reserve, the routes that the division is to take on advancing into battle and all the hundred and one items that go to form the information that the divisional commander is issuing to his brigades.

This information is required as soon as it is issued. The A.D.M.S. cannot afford to wait, as in former times, until he gets it second hand from A. & Q. Orders have to be issued to the field ambulances by the A.D.M.S. in both his capacities, i.e. administrative and as commanding officer. The field ambulances are divisional troops. Various moves may have to be made so that the medical arrangements fit in with the general tactical scheme. Perhaps No. 1 brigade is to be in reserve, but No. 1 field ambulance is required to take part in the evacuation of casualties from the forward area. This may necessitate a move out of the brigade area in which No. 1 field ambulance, for the moment, is billeted.

As a general rule, as soon as the A.D.M.S. has got the essential details of the proposed "G" plan he will hold a conference with his field ambulance commanders or representatives from these units. At this conference he will give the field ambulance representatives a pre-picture of the situation and outline the part that they are to play so that their units can get ready to act at once, before the actual operation orders are issued; the information thus given should be considered as an order but in every case it will be followed by the orders in writing.

At the same time the A.D.M.S. in consultation with the A. & Q. staff will draft the paragraph for inclusion in the divisional administration instructions. This paragraph includes locations of the medical posts, orders for the disposal of the field ambulances as far as those orders concern the brigade commanders, i.e. whether the field ambulances are under brigade command, etc. The R.A.M.C. operation orders are instructions for the field ambulances and other medical units and are sent to the brigades for information only. The divisional staff alone can issue orders to the brigade commanders.

At this point it may be well to stress the point that a field ambulance bearing the same number as a brigade does *not belong* to the brigade, and may frequently have to work with one or other of differently numbered brigades. In other words, whilst more often than not the field ambulance is brigaded for ease of administration, it essentially comes under the heading of "Divisional Troops," and unless definitely handed over to the brigade, takes its orders from the divisional headquarters.

It follows, therefore, that the A.D.M.S. must be included in the list of officers on divisional headquarters who join the divisional commander in the advanced or battle headquarters. It is only by this arrangement that

adequate and rapid information can be sent to the field ambulances as to the part that they are to play in the divisional operations, and the A.D.M.S. enabled to keep in touch with the kaleidoscopic changes of the situation in a war of movement.

It is very difficult for the "M" branch to carry out its duties if it is broken up. Therefore, the whole of the "M" branch must be included in the advanced headquarters. The D.A.D.M.S. is of no use if he is relegated to rear headquarters; all his work is connected with the troops in the forward area, apart from the routine office work that he has to perform. He is in any case the medical officer for divisional headquarters, and if the majority of the headquarters moves to the forward area, the D.A.D.M.S. should be with them, with the medical equipment.

By these means the final link in the liaison chain will be forged.

(10) *Intercommunication.*

Much as the field ambulance commander may loathe the idea, it is essential that one of the precious five motor cycles must be sent to the A.D.M.S. office. The divisional signals have more than they can manage, and it is but rarely that one can get a special D.R. to send to the field ambulances with any particular message. Messages sent by the D.R.L.S. arrive, but delay is the price that has to be paid in active operations. It is, therefore, much safer and quicker for the "M" branch to maintain its own system of intercommunication.

As an aid to intercommunication and the reception of messages all field medical posts should be well signboarded. In each field ambulance one or more men should be detailed for this duty and it should be their responsibility to place the signboards *and*, when the unit moves, to collect them again. It was found that the former was often quite well done, but when the unit moved the signs were left *in situ*, so that when they were required again new ones had to be made or important crossings were missed out.

Whenever possible the Provost Company should be amongst the first to get information of the exact locations of the various car posts, etc.

(11) *Training of Field Ambulances and Regimental Medical Personnel.*

It is not intended that a complete system of training should find expression in these notes, but some points of importance might be stressed.

The dispersal theory of modern warfare demands that the N.C.O.s of the units should be well practised in using their own initiative and should be taken into the confidence of their officers to a large degree. N.C.O.s will frequently find themselves in situations that make it difficult or impossible for them to get advice from their officers and they will have to act rapidly and make decisions affecting the personnel under their immediate control. It is, therefore, essential that they should be thoroughly conversant with the tactical situation and have a good knowledge of what

duties the unit has to perform. This requires a high grade of training in map reading, the tactical use of the field ambulance, the methods and means for the evacuation of casualties. They should be given opportunities to practise the handling of the various sections of the unit, to make reconnaissances, site car posts and act as "bearer" officers.

There is a tendency to assume that an officer must "make all the running" when plans are being made for some operation, but the advice from men who have had to do a good deal of the actual working of the schemes is frequently very valuable. Whilst the N.C.O.s of the unit should be able to look up to their officer and feel that in his hands they are being given a fair deal, at the same time the unit will be very much more efficient if it can boast of a collection of N.C.O.s so well trained in the duties of a field ambulance in actual war that, even if the officers are not available, the work will carry on with equal efficiency. To reach this standard the N.C.O.s must be given a chance to take practical charge of the various branches of the work and must not depend entirely on theory. The N.C.O.s must be allowed to take charge on field days and exercises; the officers might on these occasions act as umpires and, whilst holding a watching brief, make sure that the "learner" is really having a chance to take control and give orders, correcting errors where necessary but not interfering unduly. In this way self confidence is engendered and the N.C.O. is taught to take a pride in the way he does the work entrusted to him.

It is not always easy to find replacements for N.C.O.s who have been knocked out and the only way in which this can be done is to encourage the same principle amongst the private soldiers and the junior N.C.O.s. Under stress and strain many a man who has not shown up before demonstrates the fact that he has the qualities that are necessary for a good N.C.O.

In "peace" time he has little chance of bringing out these qualities, but, by making the men take an active part in the actual working of the schemes, by giving them jobs that require intelligent anticipation, unsuspected talent may be found. It is always a good thing to encourage the art of leadership.

Medical officers of battalions have a heavier task before them under modern war conditions. It is essential that they train a large number of men in their unit in first aid. It is not enough to say, "I have given my stretcher bearers several courses of instruction." This instruction must extend to as many men in the unit as can be managed when all the other forms of specialized training are taken into consideration. The dispersal of the unit in isolated defensive or offensive posts means that casualties will be hard to collect, and that the individual will have to depend on his comrades when he gets wounded, until an opportunity is available for his removal to the R.A.P. Whilst a little knowledge may be a dangerous thing, even a little may be the means of saving a valuable life.

Every use should be made of the Field Hygiene Section. Courses of instruction should be arranged through "G" for the personnel of the

fighting units in military hygiene, not merely classes for potential sanitary squad personnel. When a divisional school is in being the O.C. Field Hygiene Section can be very useful in giving the junior commanders class a "whip up" in sanitation and general hygiene.

Lastly, but by no means last in importance, is the question of the closest co-operation between the Army medical authorities and the civil administration for first aid and disposal of casualties in this country.

There is no distinction between a military and a civil casualty. The whole country is at present in the front line; mutual co-operation and understanding will greatly assist both sides.

All R.M.O.s and field ambulance commanders should make sure that they have accurate information of the locations of the civil aid posts and hospitals in their area and it is the duty of the Army medical authorities to keep their civil counterparts well informed of the locations of the military medical units.

A MODIFICATION OF THE METHOD USUALLY EMPLOYED TO OBTAIN SPECIFIC CULTURES FROM SALMONELLA GROUP VARIANTS.

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THE discovery of diphasic variation by Andrewes (1922) suggested the possible existence of three types of motile members of the Salmonella group, namely, diphasic organisms, organisms monophasic in the specific phase, and organisms monophasic in the group phase and, until recently, examples of all such types were recognized. Later investigations, however (Kristensen and Bojlen (1936), Edwards (1936), Kauffman (1937), Archer (1938)), have shown that all those organisms which up to the present have been described as monophasic in the group phase are not so in fact, since the specific phase can be obtained from them by appropriate methods, and no such organism finds a place in the Kauffman-White scheme as recently amended by Kauffman.

The object of this communication is to describe a modification of the usual method of growth in the presence of group serum, as described by Scott (1926), for obtaining specific suspensions from group phase cultures; and to confirm by its use the discoveries by Kauffman and Edwards of specific phases of *Bact. thompson* var. *berlin*, and *Bact. newport* var. *puerto-rico*.

DISCUSSION.

When an organism in the group phase is submitted to the action of group serum in a fluid culture medium three types of response are theoretically possible.

(1) There may be no change in the antigenic structure of the organisms, so that all are agglutinated as they grow, forming a deposit at the bottom of the tube.

(2) Organisms in the specific phase may be produced and grow in the broth unaffected by the group serum present.

(3) A non-motile "O" variant may arise if the "O" antibodies present in the group serum used are heterologous to the "O" antigens of the organism under investigation, which appears to be almost essential to avoid S→R variation. This "O" variant, like the specific variant, will grow unaffected by the group serum present.

This third possibility is one which, in fact, commonly occurs and so prevents the successful use of Scott's method.

The Modification.—The modification to be described was devised to diminish the liability to "O" variation referred to above and combines the use of the "soft agar" technique for inducing or enhancing motility described by Colquhoun and Kirkpatrick (1932) with that of culture in

group-serum broth, thus bringing highly motile organisms continuously under the influence of group serum.

Three methods of applying this principle have been tried and are described below. The first has given the most satisfactory results.

First Method.—A sterile “U” tube is filled to about one-third of the height of the side limb with soft agar. The agar is of such consistency that if allowed to set in a 12-ounce bottle, it readily disintegrates on shaking (approximately 0.6 per cent). When the agar has set in the “U” tube one limb is filled with sterile group-serum-broth which displaces the agar towards the other limb until the levels are equalized. Inoculation is carried out by breaking the upper surface of the agar with a loop charged with the organisms under investigation. By the time organisms reach the broth after passing through the column of soft agar they should be highly motile and in a condition very favourable for variation of the flagellar antigens rather than H→O variation.

Success has attended the use of this method in certain cases where Scott's method alone has failed. Unexpected failures, however, have also occurred. Two technical defects have probably accounted for most of these: (1) fissuring of the agar; or (2) passage of broth between the side of the tube and the agar as the levels are equalized. Both these accidents are incidental to the lack of special apparatus and the consequent inevitable movement of the agar after setting. The preparation of a special “U” tube with one clear and one ground glass limb joined by a tap should prevent their occurrence.

Second Method.—Plates of soft agar, similar to that already described, but with the addition of group-serum-broth, are poured. These are inoculated by breaking the surface at the centre of the plate with a charged loop.

If spreading growth occurs subcultures are made from its edge, or the agar is broken up, saline is added, and the whole filtered through filter paper.

This method is based upon the assumption that motility, and consequent spread, are only likely to occur if the organisms are inagglutinable by the serum present.

Third Method.—This consists of the *alternate* use of soft agar with or without group serum, and group-serum-broth.

PRODUCTION OF SPECIFIC CULTURES FROM *Bact. thompson* VAR. *berlin* AND *Bact. newport* VAR. *puerto-rico*.

Utilizing the above modification of Scott's technique, specific cultures of *Bact. thompson* and *Bact. newport* have been obtained from their respective group variants, *Bact. thompson* var. *berlin* and *Bact. newport* var. *puerto-rico*.

(a) *Bact. thompson* var. *berlin*.—The culture used was received from the Lister Institute (N.C.T.C.).

An early subculture showed “O” variation; subculture to *Bact. stanley* (group), serum-broth also produced an “O” suspension (“culture O”), and continued work with this strain showed that it possesses

a marked tendency to "O" variation though other subcultures from the original culture received proved to be motile and "group" (or mixed) antigenically.

Soft agar in a "U" tube, the other limb of which contained *Bact. stanley* (group) serum-broth, was inoculated from the original slope received. After incubation the supernatant portion of the broth was found to contain motile specific *Bact. thompson* ("culture P").

A subculture from "culture P" to broth lost its motility and specific "H" agglutinability ("culture P1"), but the supernatant portion of a subculture of "culture P" in *Bact. stanley* (group) serum-broth showed a few motile organisms and specific "H" agglutination ("culture P2"), and a soft agar plate also inoculated from "culture P" similarly produced a specific *Bact. thompson* suspension ("culture P3") when broken up with saline after incubation and then filtered.

Two other cultures in soft agar inoculated from colonies on a plate subculture from the original culture received only gave rise to the production of the "O" variant when subcultured in *Bact. stanley* (group) serum-broth ("culture R" and "culture S").

These results are summarized in Table 1.

TABLE I.

Abbreviations. The following abbreviations are used for the sake of brevity in this table and subsequently.

Name of organism, etc.	Abbreviation.
<i>Bact. thompson</i> var. <i>berlin</i>	Berlin.
<i>Bact. newport</i> var. <i>puerto-rico</i>	N.P.R.
<i>Bact. cholerae</i> suis var. <i>kunzendorf</i>	Kunzendorf.
<i>Bact. typhi</i> murium var. <i>binns</i>	Binns.
A "U" tube of soft agar and nutrient broth	U.
" " " " " and Binns serum-broth	UB.
" " " " " and <i>Bact. stanley</i> (group) serum-broth	US.
Binns serum broth	B.
<i>Bact. stanley</i> (group) serum-broth	S.
Soft agar	SA.
Filtrate from a soft agar culture broken up in saline	SAF.

SUSPENSION.	METHOD OF PREPARATION.	SERUM.	
		<i>Bact. thompson</i>	Kunzendorf.
<i>Bact. thompson</i> (specific)	—	1/20,000	0
Kunzendorf	—	1/50	1/5,000
Berlin "culture O"	Culture on <i>Bact. stanley</i> (group) serum-broth.	<1/500	
" " " culture P "	US	1/20,000	1/25*
" " " culture P1 "	US subcultured in broth	<1/500	1/25*
" " " culture P2 "	US → S	1/20,000	0
" " " culture P3 "	US → SAF	1/20,000	0
" " " culture R "	SA → S	<1/500	0*
" " " culture S "	SA → S	<1/500	0*

<1/500 = less than 1/500, i.e. no agglutination at 1/500 or higher dilutions.

* Result after two hours all showed agglutination of a somatic type to 1/250 or more after standing at room temperature overnight.

Thus specific *Bact. thompson* suspensions were obtained from *Bact. thompson* var. *berlin* by a combined use of soft agar and group serum-broth.

(b) *Bact. newport* var. *puerto-rico*.—The culture used was received from the Lister Institute (N.C.T.C.).

The results of the tests carried out, which are similar to those obtained with *berlin*, are shown in Table II together with the results of titration of a serum prepared against this variant. The latter demonstrate the presence of recessive specific agglutinogens in the group inoculum used for immunizing the rabbit.

TABLE II.

SUSPENSIONS.	METHOD OF PREPARATION.	SERUMS.			N.P.R.
		Newport (fresh)	Newport (stock)	Kunzen-dorf.	
<i>Bact. newport</i>	Standard agglutinable suspension R.A.M. College.	1/500 †	1/100 †		1/250 †
<i>Bact. newport</i>	Grown in <i>Bact. stanley</i> (group) serum-broth.	1/5,000 †	1/500 †	0	
<i>Bact. newport</i>	Grown in soft agar and subcultured to broth.	1/1,000 †		0	1/1,000 tr.†
<i>Bact. morbificans</i> bovis (group)		0			
Binns		0			1/5,000
<i>Bact. stanley</i> (group)		0			1/5,000
<i>Bact. newport</i> (group)		1/125 tr.		1/250	1/10,000
<i>Bact. newport</i> "O"		1/250	1/25		
N.P.R.	SAF		1/50 *	1/500-	
"	Broth		1/50	1/500	
"	US	1/125 *	1/50 tr. *	< 1/500	
"	US→B		< 1/50	< 1/500	
"	US→S	1/125 *	1/50 tr.	< 1/500	
"	US→S.B.B.→UB	1/5,000	1/500		
"	US→S.S.S.→US	1/5,000	1/500	0	
"	UB	< 1/1,000		0	
"	U→SAF	< 1/1,000		0	
"	UB plated, 8 colonies to broth of these " Broth 2 "	1/2,500	1/500	0	

Newport (fresh) is a recently prepared serum.

Newport (stock) is a standard agglutinating serum prepared at the R.A.M. College.

* Granular, ? "O"

† Variation possibly due to quantitative variation in antigens "e" and "h."

I was not successful in attempts to demonstrate the specific antigen "C" in *Bact. typhi suis* var. *voldagsen*. Kauffman, however, has informed me that he has succeeded in demonstrating the specific phase of this variant.

CONCLUSION.

The work of Kauffman and Edwards which demonstrated the presence of specific antigens in *Bact. thompson* var. *berlin* and *Bact. newport* var. *puerto-rico* is thus confirmed. The value of the combined use of soft agar and serum-broth as a means of obtaining specific phase cultures from apparently pure group phase organisms, by preventing the development of the "O" variant otherwise so liable to occur, is demonstrated.

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A BRIEF SURVEY OF THE TREATMENT OF FRACTURES OF THE LEG AND FOOT.¹

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IN this communication I wish to discuss the treatment of fractures based chiefly on Böhler's methods, with modifications suggested by others, and a small personal experience added. I shall commence by discussing closed fractures of the leg from above, downwards.

1.—*Fractures of the Spine (Intercondylar Eminence) of the Tibia.*

There will nearly always be a large effusion of blood into the knee-joint. The treatment will depend on (a) whether practically no displacement exists allowing full extension of the joint, or (b) gross displacement, preventing full extension of the joint.

In the case of (a) a firm bandage is applied over the joint to limit further effusion and swelling, and the limb immobilized on a back splint (such as Cramer's) from the toes to the hip. At the end of four days the joint is aspirated and bandage and splint re-applied. After a further three days, if there be no recurrence of effusion and swelling has subsided, Unna's paste dressing is applied from the toes to the tibial tuberosity. The next day a plaster of Paris cast is applied over the Unna's paste from just above the malleolus to the hip-joint. The following day, the patient is allowed up, walking. By using Unna's paste under the plaster of Paris, good movements of the ankle are maintained. The cast is kept on for seven to eight weeks, at the end of which it can be dispensed with if X-rays are satisfactory. The fracture should be X-rayed through the plaster cast every three weeks.

In the case of (b), if marked displacement be present, it will be impossible to extend the knee-joint. Therefore, before even a satisfactory X-ray can be taken, the knee-joint will usually have to be aspirated and manipulated until full extension is obtained. This manipulation alone will nearly always cause a satisfactory reduction of the displaced fragment. Having achieved a satisfactory reduction, a firm bandage is applied to the joint and a back splint from the toes to the hip for seven days. At the end of this period, if there is no recurrence of effusion, and swelling has subsided, immobilization in Unna's paste and plaster of Paris is carried out as in the case of (a).

Three or four months after the accident, movements of the knee-joint will usually be limited by adhesions. These can be easily broken down under nitrous oxide or evipan anæsthesia. This procedure should be carried out gradually by slight manipulation once weekly, followed by normal

¹ Read before the Shanghai Medical Society, March, 1940.

walking. The final results are usually satisfactory. In rare cases where displacement cannot be reduced sufficiently to allow of full extension of the joint, and in old untreated cases, the displaced fragment must be removed by open operation through an incision in the same way as for removal of a cartilage.

2.—*Fractures of the Condyles of the Tibia.*

In these fractures, there is nearly always an involvement of the articular surface of the knee-joint, with a large effusion of blood into the joint. There may be (a) a fracture of one condyle with no displacement; (b) a fracture of one condyle with displacement; or (c) a fracture of both condyles which is practically always accompanied by gross displacement.

In (a), treatment is carried out as in the case of fractures of the spine the tibia, without displacement. The tibia is slightly adducted on the femur during application of the plaster case when there is fracture of the lateral condyle, and abducted in cases of fracture of medial condyle. By this means, the fractured condyle tends to be maintained in correct position by the pull of the collateral ligament which is usually intact.

In (b) treatment as in (a) for the first four days when aspiration is carried out. Combined with the aspiration the displaced fragment is levered into correct position by means of a Steinmann's pin, inserted immediately below the displaced fragment. The displacement of the fragments having been reduced they are compressed with a heavy clamp. Having obtained satisfactory reduction, a firm bandage and back splint are applied and maintained for another ten days. If X-rays show the position to be still satisfactory, the limb is immobilized in plaster cast from the toes to the hip with Böhler's walking iron incorporated. No Unna's paste is recommended in these cases, as more secure immobilization is required than in cases previously mentioned. Walking may commence the day after application of the plaster cast, and immobilization must be continued until there is firm bony union which usually takes ten to twelve weeks.

In case of (c) there is nearly always gross displacement, the central portion of the tibia being driven up into the joint between the two downward displaced condyles. Having ascertained the nature of the injury, manipulate gently (an anæsthetic will probably be necessary) until extension of the knee-joint is obtained. The limb is now immobilized on a back splint from the toes to the hip, with firm bandage around the knee-joint, and left for four days. At the end of this period reduction is commenced under an anæsthetic (spinal most useful). A Steinmann's pin is inserted through the lower end of the tibia (or os calcis) and the limb placed in a screw traction apparatus. A traction of 30 to 40 pounds is usually necessary to pull the central portion downwards. The condyles are manipulated until satisfactory reduction is obtained. The whole procedure is carried out by manipulation alternating with radiographic screening or directly under X-ray screen. The fractured condyles will usually remain in position if compressed with a heavy clamp, but if there is still a tendency to displacement, a Steinmann's pin

can be inserted through the upper third of the tibia in such a manner as to hold all three fragments. The limb is then immediately immobilized in plaster of Paris from toes to hip, without Unna's paste, the pin or pins being incorporated in the plaster cast. Extension is maintained by means of the pin in the lower end of the tibia for six weeks. At the end of this period, the cast and pins are removed and a new plaster applied from the toes up to and including the hip-joint in spica form.

A Böhler's walking iron is fitted and the patient allowed to walk for eight to ten weeks, at the end of which period immobilization can be terminated provided X-rays are satisfactory.

In all fractures involving a knee-joint, complete anatomical restoration of articular surface of the tibia is essential.

3.—*Fractures of the Upper, Middle and Lower Third of Tibia and Fibula.*

As soon as the signs of primary shock have subsided, the patient is allowed to sit up and a low spinal anæsthetic is given, stovaine being the most suitable. The patient is now moved to the X-ray room or to some place suitable for manipulation to be controlled by "screening." Having determined the injury by X-ray, a Steinmann's pin is inserted through the os calcis and the limb placed on Böhler's screw traction apparatus. 30 to 40 pounds traction is usually necessary to pull the fragments into almost correct position. Extension combined with alternatively manipulating and "screening" will give a satisfactory reduction of fragments.

With the limb still on the traction apparatus, a plaster of Paris cast is applied from the toes to the tibial tuberosity in case of fractures of the lower one-third of the leg, and from the toes to the hip in fractures of the middle and upper one-third of the tibia. To apply a plaster higher than the knee-joint while on the traction apparatus, it is necessary to do it in two stages. First, apply the plaster as far as the tibial tuberosity as in fractures of the lower one-third and then, as soon as the plaster has set, continue it above the knee by lowering the knee-bar of the traction apparatus. During the application of the proximal segment of the plaster, the knee must be supported in a flexed position suitable for accurate apposition to the Braun's frame.

A plaster from the toes to the tibial tuberosity is not sufficient to control fractures above the lower one-third of the leg unless a second Steinmann's pin is inserted through the upper one-third of the tibia. This second pin is usually necessary (as well as the long plaster) in cases of severe comminution and displacement.

As soon as the plaster has set, the patient is moved to the ward and the leg placed on a Braun's frame and extension of 12 to 15 pounds applied through a pin in the os calcis. This weight is reduced gradually to 4 or 5 pounds during the next two weeks.

The fracture is X-rayed every two weeks. At the end of six to eight weeks, if early union in a good position has occurred, the plaster and pin are removed and a new plaster cast applied from the toes to the hip, with the

knee a few degrees short of full extension. A walking iron is also incorporated in the plaster cast and the patient allowed to walk the next day. This plaster should be left on until good callus formation is visible. These fractures usually need immobilization for at least twelve weeks and often for as long as twenty weeks. Plaster casts should be renewed every seven or eight weeks.

In many cases even heavy extension in the long axis of the leg will not keep lateral displacement of the tibia reduced, especially in fractures of the lower third, particularly if they are compound. In these cases a system of pulleys should be arranged so as to enable lateral traction to be applied through a padded sling around the leg at, or near, the site of displacement. A lateral traction of 2 to 4 pounds combined with a longitudinal extension of 4 to 10 pounds will usually gradually reduce most types of lateral displacement. In using lateral traction the leg must be lightly strapped to the opposite side of Braun's frame to afford counter traction. The plaster under the padded sling must be softened or partially removed in order to allow satisfactory functioning of lateral traction.

In fractures of the tibia and fibula, the position of the tibia is all important. The position of the fibular fragments in some cases has to be ignored.

Open Operation.—This may be necessary when all attempts at reduction are prevented by muscle interposed between the fragments. The fragments of tibia (one usually ignores fibular fragments) are reduced by open operation (non-touch technique) and maintained in position by a steel plate (stainless steel gives best results) and screws. This plate should be removed in three to four months when good union has been attained.

4.—*Fractures of the Tibia Alone (Upper, Middle and Lower Third).*

These are similarly treated, except that the intact fibula sometimes interferes with the reduction of the tibia and in such cases Böhler recommends oblique division of the fibula. In these cases I find it more satisfactory to operate on the fractured bone (tibia), and hold it in position by means of a stainless steel plate and screws.

5.—*Fractures of the Fibula Alone (Above the Malleolus).*

These do not usually give rise to any difficulty except in cases of fracture of the neck of the fibula. In these cases, the head is pulled proximally by the biceps femoris and open operation is necessary. The displaced head is wired to the lower fragment. Other fractures of the fibula alone (excluding malleolus fractures) usually only require immobilization in a walking plaster for five to seven weeks.

6.—*Fractures of the Malleoli.*

In some cases there is little or no displacement, but when this is present, it should be reduced as soon as possible. This is usually easy to do by manipulation under nitrous oxide or local anæsthesia. The limb can be immediately immobilized in a walking plaster-cast from the toes to the

tibial tuberosity. As considerable swelling is usually present when these cases are first seen, I adopt the following procedure :—

Any reduction is immediately carried out under nitrous oxide anæsthesia and the limb immobilized in a box splint for seven days. At the end of this period the swelling has nearly always subsided and the limb is immobilized in a walking plaster-cast from toes to tibial tuberosity. The next day the fracture is X-rayed and walking commenced if satisfactory. At the end of seven weeks the plaster-cast is removed and, if X-ray is satisfactory, immobilization is terminated. If adequate callus formation is not visible, the patient is confined to bed for forty-eight hours allowing full ankle movements. At the end of this period a new walking plaster-cast is applied and immobilization continued for another six weeks.

7.—*Fractures of the Os Calcis.*

There are four recognized methods of treatment (Eastwood 1938).

- (i) Restoration of anatomical alignment.
- (ii) Application of plaster cast with foot in neutral position and arch moulded; no attempt being made to correct the deformity.
- (iii) Early arthrodesis of damaged subastragaloid joints.
- (iv) Late arthrodesis of damaged subastragaloid joints.

The first method is carried out by means of reduction with a pin in the os calcis on screw traction apparatus. A second pin is inserted through the lower end of the tibia, and both pins are incorporated in a plaster cast. Continuous extension is maintained *via* the pin in the os calcis on Braun's frame for four to six weeks. The basis of the method is the restoration of a normal salient angle of 38 to 40 degrees.

According to some surgeons the second method produces equally good results.

The third method is certainly undesirable as the subastragaloid joints are capable of considerable restoration of function, even when severely damaged. The condition may also end in painless arthrodesis without operation.

The fourth method may be worth while in some old cases complaining of pain probably originating in the subastragaloid joints.

Summary of Treatment of Fractures of the Os Calcis.—If gross displacement with decrease of salient angle is present, the first method of anatomical reduction should be carried out. The second method is suitable for cases with little or no displacement, or for cases of very severe comminution in which the insertion of a Steinmann's pin in the os calcis is contra-indicated.

8.—*Fractures of the Talus, Navicular, Cuboid, Cuneiforms.*

(a) With little or no displacement: Immobilization in a walking plaster-cast for six to eight weeks, followed by the wearing of an arch support for three to four months after the removal of the cast. The wearing of an arch support is advisable owing to the tendency to develop flat foot.

(b) With gross displacement: Reduction is carried out by means of traction and counter-traction through a pin in the os calcis and Kirschner's wire through the bases of the metatarsals.

9.—*Fractures of Metatarsals with Gross Displacement.*

Reduction by means of extension with the aid of a wire passed through the pulp of the toes and maintained for a few weeks on Braun's frame, followed by walking plaster and, finally, arch supports as described above. Usually satisfactory reduction can be obtained by manipulation without extension.

10.—*The Treatment of Compound Fractures.*

All are agreed that, if seen within the first six to eight hours, excision of damaged soft tissue and skin edges and complete closure of the wound is the ideal method. If the skin edges cannot be united, or can only be united under tension, then the wound should be left widely open and lightly packed with gauze. The wound should not be partially closed.

Loose pieces of bone if connected with the main fragments should not be removed. Foreign bodies, such as bullets, pieces of shell, bomb, etc., should be removed if easily seen or palpated, but no extensive search should be made for them, as in doing so, the risk of infection will be considerably increased. They are usually sterile and can be removed months later without danger. Infected foreign bodies, such as pieces of clothing, must be removed if possible. Plaster of Paris is the ideal method of immobilization following reduction of the fracture and treatment of the wound.

I recommend immobilization in a plaster of Paris cast without a window for the first seven days. After this, a window is cut over the wound and its progress watched. Such a method should be suitable for the rapid evacuation of cases in war. The continuance of the closed plaster method after the first week may give excellent results in the hands of experts, but, for the general surgeon only treating the occasional compound fracture, it is a highly dangerous method owing to the extreme degree of sepsis which may have occurred by the time the first severe rise of temperature is shown.

In many cases the plaster cast will have to be split longitudinally during the first twenty-four hours, due to swelling obstructing the circulation. All compound fractures should receive 3,000 units of anti-tetanic serum and 4,000 units of anti-gas gangrene serum as soon as possible.

I regret that, in order to keep this article within reasonable limits, I have been forced to write dogmatically and with little explanation.

My thanks are due to Lieutenant-Colonel C. F. Burton, M.C., R.A.M.C. Officer Commanding British Military Hospital, Shanghai, for permission to submit this paper for publication.

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STREPTOCOCCAL AND STAPHYLOCOCCAL FEVERS.

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INTRODUCTION.

THIS short paper makes no pretence to state anything that is unknown to any of us. It contains few conclusions that we have not already reached. Its purpose is merely to emphasize some of the more important features of two very common but serious infections, namely streptococcal and staphylococcal fevers. A certain restriction of outlook having inevitably crept into our modern pathology, there was a tendency to regard the several manifestations of these infective processes as separate diseases. The primary lesion of each of these organisms was apt to obscure the composite clinical and pathological picture seen in the summation of their effects upon the body. This outlook, with its concentration upon the local disease processes, did not greatly influence practical therapy because treatment consisted of measures, more often than not surgical, directed towards the particular local disturbance and less towards the disease process as a whole. However, since the introduction of and the vast progress made in the use of specific chemotherapeutic substances as M & B 693, streptocide, sulphonamide, etc., the recognition of a general disease caused by streptococci and staphylococci has become of the utmost importance.

STREPTOCOCCAL FEVER.

Although minor grades of streptococcal infection such as tonsillitis and sinusitis are amongst the commonest of the human infirmities, the severer septicæmic and bacteræmic forms of the disease are not unknown to us, although mercifully they are not of everyday occurrence.

The following three cases show many of the salient features and from them we may be permitted to draw certain conclusions in regard to the natural history, course, prognosis and treatment of streptococcal fevers.

Case 1.—Private S., aged 24, an infantryman of approximately two years' service in Shanghai. This man was admitted at 4 a.m. to the British Military Hospital complaining of a very sore throat, which he had had for two days, high fever and a shivering attack just before admission, during which he vomited once. The patient looked ill and exhausted. His throat showed intense inflammation with marked swelling of both tonsils, temperature 102·4° F., pulse 100. His heart sounds were of poor quality. In view of a prevailing outbreak of diphtheria among the soldiers of his battalion at the time he received 20,000 units of anti-diphtheritic serum once pending the result of a throat swab. This was returned negative the following day. He was recognized as a case of streptococcal fever and

received 10 c.c. of anti-streptococcal serum the morning after admission. He received a further 20 c.c. eight hours later. Between the time of his admission and midnight on the following day he received eight grammes of streptocide. His condition that evening was very poor. His temperature had risen to 103° F. and his pulse to 130. His white blood-count was 14,000 white cells per c.mm. He was a little better the following day, his temperature having dropped to 100.6° F. and his pulse to 110. His throat was still very dirty. He was receiving one gramme of streptocide four-hourly. The next day improvement was again noticed but his spleen had become palpable and tender and his urine contained albumin and red cells. His temperature rose again the following day. He looked worse and complained of pain and tenderness in his left knee. His spleen was still obvious. For seven days he continued with a high fever and rapid pulse. The same dosage of streptocide was continued. His temperature then subsided to normal and although his throat was still inflamed it was no longer painful. As he was showing a slight degree of cyanosis the streptocide was discontinued. Two days later he had an exacerbation of his fever. No further local signs were discovered and his urine was clear. He was once more placed on streptocide which was continued for a further five days. His temperature then subsided and convalescence commenced.

Case 2.—Corporal H., aged 35, clerk in the R.A.M.C. This man, while in hospital convalescing from a left basal pneumonia, for which he received M & B 693, developed a slight evening temperature and a mild sore throat. He had been getting up and was about the ward. He was a fat, flabby, unhealthy looking individual, and a W.B.C. taken during the course of his pneumonia revealed a count of 17,400 white cells per c.mm. His throat was inflamed, but this began to subside. Eight days after its onset he had a sudden shivering attack and developed: (1) an acute sore throat with pus-streaked tonsils, (2) tenderness and cutaneous hyperæsthesia in the right iliac fossa, and (3) acute tenderness over the gall-bladder. His temperature was 101.8° F., pulse 130. In addition, he complained of præcordial pain which radiated down the inner side of his left arm. His pulse was extremely rapid and his heart sounds were of very poor quality. A W.B.C. at this stage was 8,200 per c.mm. He was placed on tablets of streptocide, two four-hourly. The following day his condition was unchanged, except for quite a marked dyspnoea apparent on moving about in bed. His W.B.C. had risen to 10,000 per c.mm. His throat was still sore. A throat swab showed K.L.B., and he was transferred to the Isolation Division. He received 30,000 units A.D.S., and the dosage of streptocide was increased to four tablets four-hourly. The following day there was improvement and his temperature had subsided to 99.6° F., his W.B.C. to 12,400 per c.mm. The heart sounds were still poor and dyspnoea still present. His condition improved, streptocide was reduced to one tablet every four hours, and after six days more was discontinued. Improvement was maintained and his temperature remained normal, although his pulse still rose

on any slight effort or movement. His W.B.C. was now 8,200 per c.mm. He still remains in bed. Tenderness has left his appendix, but there is still a definite inspiratory catching of his breath on palpating the gall-bladder. Tachycardia and dyspnoea are still easily produced.

Case 3.—Private G., aged 24. This patient was admitted complaining of fever, shivering and a very sore throat, temperature 102.2° F., and pulse 120. Speech was difficult owing to a gross inflammation of the tonsils and cedema of the surrounding tissues. The urine contained large quantities of albumin (5 gr. per litre). A throat swab was negative for K.L.B. Streptococcal fever was diagnosed and he received two tablets of streptocide every four hours for four days. His temperature then subsided and he felt better. Three days later his temperature rose again to 100° F., and remained up for two days. During this period he received only local treatment to the throat condition. He was then placed again on streptocide, two tablets three times a day. The fever did not subside and his condition deteriorated, and the dosage was increased to two tablets four-hourly. In addition he received 10 c.c. of anti-streptococcal serum. This dosage of streptocide was continued for four days and for a further day after his temperature had subsided to normal. His fever subsided gradually. The dosage was then cut down to one tablet four-hourly for three days, and then one three times a day for two days, and his recovery was complete. Throughout the acute stage of his illness his urine was loaded with albumin, but no casts or R.B.C.s were ever seen. Quantities of albumin up to 1 gr. per litre were noted.

These three cases all have certain features in common; each of them demonstrates incidents which may occur in any case of streptococcal fever. They all had the same original focus of infection, the mucous surface of unhealthy tonsils. In Case 1 the portal of entry had been well prepared for the streptococcal invasion by a previous attack of Vincent's angina and ulcerative gingivitis.

In streptococcal fever, however, the portal of entry varies widely, the large raw area of the placental site contrasting with the insignificant hangnail of the overworked medical man, while the unhealthy cryptic tonsils of cases such as the three just quoted occupy an intermediate position.

The onset of the disease is sudden and is characterized by the occurrence of high fever, malaise, chilliness and actual rigors. This was a marked feature in all these cases. The organism spreads rapidly throughout the body. The fever remains high, rarely descending to the base line, while the pulse is extremely rapid. There is a marked systemic disturbance. In all these cases there was a marked primary local infection of the tonsils.

In two cases, one of which I have not reported, there was a marked secondary disturbance which resulted in rapid splenic enlargement, which was accompanied by a considerable degree of pain and abdominal discomfort, due no doubt to an accompanying amount of perisplenitis. Further secondary manifestations were observed in Case 2. Here, after an initial tonsillitis, the appendix, the myocardium and the gall-bladder were all rapidly and

successively involved. The tendency for these fevers to have metastatic manifestations in organs with mucous surfaces was well marked in this case. Although the appendix has more or less settled down, the gall-bladder is still inflamed, and will, I think, come to another acute exacerbation. This patient is going to present a considerable problem as to his future treatment as one is left a little uncertain where to start. At present the consensus of opinion leans towards his tonsils.

Metastases into the serous sacs are a further feature of streptococcal fevers and although in this small series there was no actual incidence of this, in Case 1 the occurrence of pain and tenderness in the left knee was suggestive of an abortive attempt at an arthritis and an effusion into the joint by the streptococcus which was wandering through the body. Did chemotherapy abort this occurrence? I am tempted to think that it did.

In one other case, about which I was unable to obtain any notes, a severe diarrhoea with blood and mucus in the stools, occurred. This case was in many aspects similar to Case 1. A general infection followed a very septic throat and after a few days' illness characterized by rigors, sweating, fever and a rapid and painful enlargement of the spleen, he developed a quite marked distension with tympanites and discomfort and this was accompanied by dysenteric manifestations, the stool growing nothing on culture. This case, by the way, also received anti-streptococcal serum and large doses of streptocide and made a good recovery.

There is a further secondary manifestation upon the body in these streptococcal fevers. I refer to the effects of the infection upon the kidneys. In two of the three cases quoted, urinary changes were recorded. In Case 3, a severe infection of the throat, a very heavy albuminuria was noted, which subsided and disappeared with his recovery. At no time were red blood cells or casts discovered. Contrast this with the first case reported, where albumin and red blood corpuscles were observed. This case also cleared up. These two cases show two types of renal involvement. The first one, with the heavy albuminuria with no red cells or casts, I am inclined to regard as a larval nephrosis, the pathological change probably being a severe degree of cloudy swelling of the kidney tubules. The second case showing albumin and red cells was probably a focal glomerulonephritis and would have shown the corresponding pathological changes. Not all cases clear up as did these two. Diffuse glomerulonephritis can, and does, occur as a manifestation of streptococcal fever and permanent renal damage may ensue.

This mention of renal involvement in streptococcal fever brings to our notice another well-defined type of case. I refer to scarlet fever.

This is a streptococcal fever with the initial lesion in the mucous membrane of the throat. It has a well-marked onset with fever and vomiting, accompanied by a considerable degree of tachycardia. It has, as a secondary manifestation, the evidence of renal damage. In short, it presents every feature shown by the cases reported earlier on in this paper, but it has a characteristic skin manifestation.

Why this should occur in some individuals who have a streptococcal fever and not in others with identically the same fever, gives rise to some thought.

Is the erythema of scarlet fever an outward and visible sign of a pre-existing sensitivity in certain individuals towards the streptococcal exotoxin?

Should we regard all streptococcal fevers accompanied by a tonsillitis as legally defined infectious diseases and act accordingly?

It is on this note of interrogation that I will leave the clinical aspect of the streptococcal fevers and pass on to some consideration of their prognosis and treatment.

PROGNOSIS AND TREATMENT.

Since the introduction of the sulphonamide group of drugs the prognosis of the streptococcal fevers has improved out of all knowledge. Take for example Case 2. This case had a poor leucocytosis even with his initial pneumonia. He was a type ill-adapted to deal with a severe infection and his chances in the pre-sulphonamide days would indeed have been gloomy. We have now a potent weapon forged to our hands for the prevention of the development of those localizing manifestations for which we used to wait with mixed feelings of hope and fear; hope, that their development would assist the patient in his struggle against the disease; fear, that they would develop in sites which would render us impotent to interfere surgically. The constitution of the individual and the leucocytic response are guides to prognosis, but specific chemotherapy and its immediate effects are more often the key.

TREATMENT.

Although in this connexion any contribution of mine will not be original, there are one or two points well worth emphasizing, particularly in connexion with the chemotherapy of these fevers.

The first point is this: that no matter what brand or type of sulphonamide is employed, the initial dosage must be high and the dosage must be maintained at a high level during the early stages of the disease. These drugs are rapidly excreted in the urine and it is of the utmost importance that a high serum concentration of them be obtained in the early stages. If given in small doses such a serum concentration as would be adequate to interfere with the metabolism of the circulating bacteria (as indeed is the probable mode of action of these drugs), is never obtained in severe cases. Its premature withdrawal has the same effect and the infection once again regains the upper hand. This is shown in Cases 1 and 3. In both these cases the drug was stopped too soon and a recurrence of the fever occurred.

The next point is the incidence of *cyanosis* in cases receiving these drugs. Case 1, when on the way to recovery, showed a slight cyanosis which resulted in the stoppage of the drug. He relapsed as soon as it was discontinued,

improving again on the drug being readministered to the point where a mild cyanosis re-occurred. I am of the opinion that cyanosis in a moderate degree does not matter and that it may be taken as a sign of adequate dosage and sufficiently high plasma content of the drug for bactericidal purposes.

In any case it can be dispersed by the administration of methylene blue.

White blood-counts carried out on these patients, although perhaps on the low side for an adequate natural aid to recovery, showed no evidence of *agranulocytosis*. This complication is, I think, rare, and is a possibility more to be *aware* of, than to be *afraid* of, in connexion with the use of these drugs.

Finally, the place of anti-streptococcal serum. Two of the cases quoted were considered ill enough to receive serum in addition to streptocide. Some authorities regard serum as a life-saving measure, others deny its use to be of value. I think its use is best regarded in the following way. "Serum by itself is effective, streptocide by itself is effective, but both together, they are an extremely powerful weapon."

Last, but not least, comes the consideration of *general* treatment. This is mainly directed towards mobilizing the natural defences to meet the emergency. An adequate fluid intake of sweetened drinks, attention to the pain and discomfort of the local lesion and the maintenance of the general well being of the patient all have their place. Above all, do not let us forget the treatment, during convalescence, of the inevitable anæmia which has occurred and will always occur in every case of streptococcal fever.

STAPHYLOCOCCAL FEVER.

By contrast to the preceding type of infection the portal of entry of the staphylococcus is the skin. The primary lesion is on the body surface and takes the form of a boil, carbuncle or minor pimple. Mucosal infection is rare. Staphylococcal infections such as these constitute a considerable proportion of the infirmities with which we are called upon to deal, more especially in military practice where minor injuries and abrasions, with a superadded staphylococcal infection, are extremely common. The familiar diagnosis of I.A.T. has its origin in the majority of cases from the *Staphylococcus aureus*. Such infective processes, fortunately, rarely proceed further than the local lesion. Localization is generally good, there is a sound tissue response and the affair ends at this point.

Occasionally, however, such infections may catch the body "napping" as it were and a bacteræmia supervenes. A general infection is now complicating a local lesion. Occasionally it happens that the local lesion may not be discoverable at the time of onset of the fever. It has come and gone but not before it has left its fingerprints. In suspected cases of staphylococcal fever, therefore, a careful clinical history is of the utmost value in diagnosis and the forgotten occurrence, a short time previously, of a local septic lesion may be the clue required to solve the puzzle in an unknown febrile disorder. Generally speaking, the onset of a staphylococcal fever is quite sudden.

The initial bacteræmia giving rise to fever, shivering and malaise, sometimes even rigors occurring. This is less usual and not so often the case as in a streptococcal fever. The pulse, although rapid, is never raised to the same extent and consequently other infections, such as the enteric group or influenza, may be suspected.

There is no enlargement of the spleen and localizing signs are generally rapid in making their appearance. In nearly all cases there is a bacteræmia with ultimately a demonstrable metastasis or fixation abscess. Such a metastasis may be solitary or it may multiply in various tissues of the body, depending on how the body itself is dealing with the temporarily circulating organism.

Staphylococcal metastases show a preference for the more solid tissues. We are familiar with the organism settling down in the capillary loops at the diaphyseal ends of the bones, giving rise to a picture of acute osteomyelitis. We know only too well of the possibilities of perinephric infection. We have seen from time to time collections of staphylococcal pus in the muscles and tissue planes.

Contrast this with the streptococcus whose choice falls upon the serous lined cavities and the mucous membrane of internal organs.

The continued fever, in the absence of rigors or sweats, with the fairly rapid formation of a local abscess, is in favour of a staphylococcal bacteræmia, more especially if the fever clears up upon drainage of that local abscess. It is the occurrence of these local collections of pus or the pre-purulent stage of tissue infection which places such a high diagnostic value upon an early leucocyte count. It has been stated previously that the pulse-rate is slow in proportion to the degree of fever and this early white count will be of material assistance in excluding infections such as the enteric group which have an initial leucopenia.

Furthermore, it is a guide to treatment with particular reference to surgical interference as I will try to show from the case reported below.

This case in many ways shows most of the features of a typical staphylococcal fever. The clinical history, its onset, its course, diagnosis and treatment present a picture of the natural history of the disorder almost in its entirety.

Case 1.—Private R. This patient was a sturdy well-built soldier, aged 23. His duties as an orderly in the dining hall, cookhouse and with the dishwashing plant entailed heavy work and fairly long hours. Three weeks prior to his admission to hospital, I had incised and drained a local abscess on one of his fingers. A large slough was removed and the hand recovered rapidly. He returned to work and forgot completely about it.

On January 2 he reported sick saying he had been shivering and felt ill, and that he had a severe pain in his right loin. He was doubled over to the affected side and all around the right renal area he was acutely tender. His temperature was 100° F., and his pulse 90. He had frequency of micturition. The urine was acid and contained a few pus cells. He was admitted at once

to hospital and placed on fluids and alkalis, four-hourly. The diagnosis of acute pyelitis was made. The following day he had red cells in his urine. The pain was worse and his fever still high. It remained up between 100° F., and 102° F., and never subsided to the base line. Three days after admission his W.B.C. was 8,000 per c.mm. (82 per cent polymorphs). A straight X-ray of the renal area showed nothing. His fever continued and he had one or two severe sweats. His urine became clear. A diagnosis of perinephric abscess was considered at this stage. Ten days after admission he was placed on M & B 693 two tablets four-hourly, and received this quantity for seven days. It had no effect at all on his fever and was discontinued. During this period his respirations were raised and a dullness developed at the right lung base. Aspiration failed to reveal any fluid. Seventeen days after admission his W.B.C. was 13,600 per c.mm. An intravenous pyelogram was done and showed no abnormality. The next day his W.B.C. was 14,200 per c.mm.

Operation and exploration of the right renal area were considered at this point, but the fact that the W.B.C. never reached a really high figure decided us against it and natural resolution was considered a possibility. Besides it was thought that in all probability no pus would be present, or at the most about a drachm among oedematous perirenal fat. Twenty-three days after admission his temperature started to subside and on the twenty-seventh day of his illness it was normal, and his W.B.C. had dropped to 11,400 per c.mm. Retrograde pyelography showed nothing. His temperature has remained down and his recovery has been uneventful. Except in the initial stage of the fever his urine remained clear.

This case demonstrates well, I think, several features of a staphylococcal fever. The history of a septic lesion in the hand revealed a point in its ætiology. The fact that he forgot about it shows the value of a careful clinical history, particularly with reference to the occurrence of local septic conditions. Its sudden onset, with the initial bacteræmic symptoms and its rapidly developing metastatic manifestation in the solid tissues surrounding the kidney are all part of the same picture. The high fever, with its relatively slow pulse, the rising leucocyte count and its aid to diagnosis are all points which I wish to stress.

A further point in this case which weighed against operation was the negative finding with X-rays. There was no loss or blurring of the outline of the border of the psoas muscle on the affected side. In a well-developed perinephric abscess, this is quite a constant feature and is of considerable diagnostic value.

There is one feature of this case which is not in accord with the true picture of a well-defined staphylococcal perinephric metastasis. It will have occurred to the reader that the urinary findings are not quite consistent with a perinephric abscess of this type. On admission this patient had pus cells in his urine and the following day he had red blood corpuscles in addition. This is the exception rather than the rule. It will be recalled that

it is the streptococcal fevers which prefer the actual kidney tissue and which can inflict an actual nephritis. This occurrence can be explained, however, if we pause to consider the various ways in which a perinephritis can occur. There are, generally speaking, three ways in which this may happen :—

(1) By blood-borne infections. Here the organism reaches the renal cortex *via* the blood-stream from a primary local lesion. It forms a sub-cortical abscess, which bursts outwards through the tissue planes to give rise to perinephric cellulitis.

(2) From an already infected and disorganized kidney, the infection arising by a direct outward extension.

(3) From an infection, co-existing in the pelvis, for example, a pyosalpinx, spreading upwards *via* the retroperitoneal lymphatics.

In those cases having their origin under group (1) (infection *via* the blood from a distant focus) urinary findings are unlikely although there is no reason for them not to occur, as indeed they did in this case by the subcortical abscess touching the tip of a calyx and giving rise to some degree of inflammation of the renal pelvis.

In group (2) urinary findings are generally refreshingly obvious while in group (3) their occurrence depends on the relationship of the urinary apparatus to the initial focus.

Although much of what I have just said may appear rather far from the point in a discussion upon staphylococcal fever, it may be stated that, apart from the occurrence of osteomyelitis, perinephric abscess is one of the commonest, and at the same time one of the most obscure, manifestations of staphylococcal fever and gives rise to a very real difficulty in diagnosis.

Features enabling us to point a finger in its direction are the onset of a fever following the occurrence of a local skin infection, the finding of a tender spot, the raised white cell count, and, generally, the negative urine findings. Radiography, in a well-developed case, reveals loss of clearness in the outline of the psoas muscle, while pyelography both intravenous and retrograde in a classical case, generally reveals a normal pelvis and calyces, as it did in this case. In one case, however, which occurred recently in the military hospital a slight degree of hydronephrosis was observed. This case came to operation and a large quantity of pus was evacuated from the perirenal area. The degree of hydronephrosis in this case may be explained, I think, by the large amount of perirenal oedema and consequent slight pressure upon the ureto-pelvic junction which must occur in such cases and will almost invariably interfere with adequate natural function at this point. I do not think that there were any positive urinary findings in this case prior to operation.

Such statement and speculation as I may have put forward have resulted from the consideration of two cases of staphylococcal fever. Their natural history has been noted and the value of urinary findings and X-rays discussed in connexion with the diagnosis of such manifestations of staphylococcal infection.

The question of treatment now obtrudes itself. With regard to these fevers we are not so fortunate in our therapeutic armament, as a modification of streptocide or M & B which is equally effective for staphylococcal as well as streptococcal infection remains to be discovered. In staphylococcal fevers the results of chemotherapy are disappointing. Both the cases received adequate doses of these drugs which were continued for an adequate time for their effects to be observed. In neither case did they have any effect upon the fever although whether or not they saved Case 1 from operation is a matter for some thought.

The use of staphylococcal toxoid has not fulfilled its early promise, more particularly in those types of fevers due to repeated staphylococcal skin infections. So we are forced back upon the general treatment of these cases, with careful nursing and observation, and with surgical intervention at such times and in such places as we may deem suitable.

CONCLUSION.

It will have been seen from these few observations that the clinical features of streptococcal and staphylococcal fevers are painted on a large canvas with a very generous brush. The local lesion of each is only a part, and a very small part of this picture.

The difference in their choice of site for metastasis, their secondary manifestations, particularly in regard to the kidney, together with their chemotherapy, are all features which compel our attention to these two disorders and which to some extent exercise us in taking what Sir William Gull has so concisely called "the General View."

TREATMENT OF GONORRHOEA WITH M & B 693.

BY MAJOR J. M. OFFICER,

Royal Army Medical Corps.

IN the past two years the results of the treatment of gonorrhœa with sulphapyridine (M & B 693) have been fully reported, but very little has been published on the chemotherapy of gonorrhœa in the Army.

The great difference between army and civilian treatment is that in the former case all cases are treated in hospital and this has the following advantages :—

(1) The issue of tablets can be supervised and it is thus certain that the patient is receiving them.

(2) The progress of treatment can be judged on the early morning smears.

(3) The question of "default," which is a major issue in civilian clinics (*vide* Batchelor, Lees and Thomson [1]), does not arise in the Army.

Since May, 1939, 265 cases of gonococcal urethritis have been treated with M & B 693 as follows :—

GROUP "A." CASES OF ACUTE ANTERIOR GONOCOCCAL URETHRITIS.

This group consisted of 141 cases and all were given a four days' massive treatment with M & B 693, with the idea that the higher the initial dose, the speedier the cure and the greater proportion of cures.

This treatment was on the lines laid down by Bowie, Anderson, Dawson and Mackay [2], and consisted in :—

First Day : 8 (0.5 grm.) tablets on admission, 4 tablets every four hours. (Total 16.)

Second Day : 2 tablets every four hours. (Total 10.)

Third Day : As for second day.

Fourth Day : 6 tablets divided into four doses. 2 : 1 : 1 : 2.

All tablets were given crushed up and taken with water. A drink of glucose and soda bic. was given with each dose of tablets.

An alkaline diuretic was also given and the patient made to drink at least 3 pints of barley water per day. Irrigations were only required in a few cases.

On the second morning the patient usually showed no gonococci and was almost dry. On the fourth or fifth day he was given sounds and prostatic massage and, if findings were negative, treatment was stopped and he was discharged hospital on or about the tenth day, after having had two negative prostatic smears.

Of the 141 cases treated, 130 (92.1 per cent) were discharged hospital to surveillance—apparently cured—after an average of 11.3 days. Cases

were usually marked fit for full duty within fourteen days of leaving hospital, but a few commenced full duty immediately at their own request.

The following cases are typical examples :—

Case 1.—January 4, 1940 : Admitted with profuse yellow discharge ; gonococci present. Urines (1) hazy, (2) clear. Placed under treatment with M & B 693 same date.

January 5 : Thin white discharge, gonococci absent. Urines clear. Sounds revealed no abnormality, prostate normal and prostatic smear was free from pus cells and organisms.

January 6 : No smear available.

January 7 : Treatment stopped.

January 9 : No smear available. Urines clear. Prostate and prostatic smear normal.

January 10 : Discharged hospital to full duty and surveillance.

January 14 : Played wing three-quarter for his battalion and scored two tries without any apparent ill-effects.

Case 2.—January 8, 1940 : Admitted with profuse yellow discharge ; gonococci present. Urines (1) hazy, (2) clear. Placed under treatment with M & B 693 same date.

January 9 : No smear available. Urines clear.

January 10 : Sounds revealed no abnormality. Prostate normal and prostatic smear was free from pus cells and organisms.

January 11 : Treatment stopped.

January 14 : No smear available. Urines clear. Prostate normal. Discharged to full duty and surveillance.

January 20 : Played football for his battalion without any ill-effects.

Relapses.—Out of 130 cases discharged hospital to surveillance, only five cases relapsed at a later date. All except one relapsed within two months of leaving hospital.

Failures.—Eleven cases still showed gonococci after four days' treatment but all except two of these responded to M & B 693 at a later date and were out of hospital within two months. It was found on further investigation that the majority of these cases had neglected to report sick until seven to ten days after they had noticed the discharge.

Toxic Effects.—Patients were not confined to bed unless the drug upset them. A few cases complained of nausea and a few of headache. One case developed jaundice and one developed urticaria. All ill-effects quickly disappeared when the drug was stopped.

GROUP "B." CASES IN WHICH A POSTERIOR GONOCOCCAL URETHRITIS WAS SUSPECTED.

This group consisted of 124 cases. In all cases the second urine was hazy, and on admission 11 were suffering from an epididymitis, 21 from an enlarged prostate and 1 from arthritis.

Treatment was on similar lines to that given to those cases in Group "A," except that a longer and less intensive course of M & B 693 was given.

Six tablets of M & B 693 were given daily for five days and four tablets daily were given for a further three to five days. Irrigations were only required in a few cases.

Of the 124 cases treated, 107 (86·3 per cent) were discharged hospital to surveillance—apparently cured—after an average of 16·9 days in hospital. Cases were marked fit for full duty within fourteen days of leaving hospital.

Relapses.—Out of 107 cases discharged to surveillance, only four cases relapsed at a later date. All except one relapsed within two months of leaving hospital.

Failures.—There were 17 cases; of these two had epididymitis and two had prostatitis on admission. Only two of these men were in hospital longer than two months.

Toxic Effects.—As regards toxic reactions, as with the more intensive course, a few suffered from nausea, two developed a rash and two developed jaundice, but all quickly recovered when the drug was stopped.

Standard of Cure.—Patients were kept in hospital for four days after all treatment had ceased. During this time, in addition to the absence of urethral discharge and clear urines, prostatic smears had to be free from pathogenic organisms and relatively free from pus cells on two occasions. Instrumental investigation had to show no abnormality.

Patients were kept under surveillance for two months after leaving hospital, during which time they were carefully examined at weekly or fortnightly intervals.

Relapses.—As has been seen, the relapse rate was low, the percentage of relapses in the acute anterior infections (Group "A") was only 3·8 per cent and that of the posterior infections (Group "B") was 3·7 per cent.

Although patients were only kept under surveillance for two months, the possibility of late relapses, as was found by Cokkinis and McElligott [3], was remembered, and it was possible to keep patients under observation for a year or longer, as all cases of gonorrhœa occurring subsequent to two months after leaving hospital were seen by me.

SUMMARY.

(1) A short intensive course of M & B 693, lasting four days, was sufficient to effect a clinical cure in 130 cases out of a series of 141 cases.

(2) The relapse rate was small, there being only five relapses (3·8 per cent).

(3) There were less toxic reactions than with the usual eight to ten days' course.

(4) It is suggested that the higher the initial dose, the speedier may be the cure and the greater the proportion of cures.

(5) Treatment in bed was only necessary in a few patients who felt upset by the drug.

(6) All were fit for full duty within fourteen days of leaving hospital and some commenced full duty and organized games on the day they left hospital.

(7) The results are summarized in the following table :—

	Total No. treated	No. apparently cured	Average stay in hospital	Failures	Relapses
GROUP " A "	141	130 (92·1%)	11·3 days	11	5 (3·8%)
GROUP " B "	124	107 (86·3%)	16·9 days	17	4 (3·7%)

In conclusion, the writer would like to thank Colonel J. T. Simson, A.D.M.S., China Command, and Lieutenant-Colonel C. Armstrong, *M.B.E.*, R.A.M.C., O.C. Combined Military Hospital, Kowloon, for permission to forward these notes for publication.

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- [1] BATCHELOR, LEES AND THOMSON, *British Medical Journal*, June 15, 1940.
- [2] BOWIE, ANDERSON, DAWSON AND MACKAY, *ibid.*, April 8, 1939.
- [3] COKKINIS AND McELLIGOTT, *ibid.*, December 2, 1939.



Editorial.

FOOD : USE OF POTATO FLOUR.¹

IN a letter to *The Times*, December 30, Lord Bledisloe points out that a possible effect of the recent correspondence about different forms of wheaten bread (whether sophisticated or not) may be to deflect the public mind and the land cultivators' activities away from the potato, which is a more health-giving and a far more secure bread stuff than wheat. This, he says, is the one rooted conviction which he derived from his work in the Ministry of Food in 1917-18. He considers that the shipping outlook to-day weights the scale far more than ever on the one food comparable to wheat, the whole of which can be raised from our own soil by our own people. It is not vulnerable like corn crops and stacks and if there is a surplus it can be made available for every description of livestock with the proviso that boiling or steaming is requisite for pigs. He believes that the main deterrent to the frank recognition by the Ministry of Agriculture of the potato as affording our people an absolute security against starvation is the apprehension of unfair competition in food output with the British farmer (except possibly in Lincolnshire, the Lothians and Forfarshire) on the part of allotment holders and other small-scale producers. The fear of the farmer is negligible and the number of small-scale producers should be increased to at least three times the number advocated by the Minister of Agriculture.

Lord Bledisloe writes that the sole ponderable arguments adduced in 1917 against the above contention were: (1) That farina mills, which are essential to the output of potato flour of the highest quality and fineness, were an uneconomical proposition in Great Britain and (2) there is an ineradicable British prejudice in favour of a white wheaten loaf, however appetizing may be the products of its chief carbohydrate competitor. To Lord Bledisloe it is inconceivable that any such prejudice should stand in the way of the speedy winning of the present disastrous war. In conclusion, he summarizes those factors which under existing conditions should carry special weight with those responsible for our national food supply. In the first place, the average yield per acre of potatoes is exactly $7\frac{1}{2}$ times the average yield of wheat, after in each case allowing for seed. As, therefore, for any given weight of the former a far smaller arable area is required, this consideration is fortified by the paramount importance of milk, and the difficulty of inducing dairy farmers, particularly in the West Country, to maintain their full quota of dairy cattle after ploughing up a considerable part of their permanent pasture. Secondly, potatoes yield per acre more than double the energy, reckoned in calories, than wheat does (4,700,000 calories as against 2,100,000 for wheat). Thirdly, potatoes are richer in vitamins. But in either case, these need supplementing with milk, green vegetables, or fruit. Wheaten bread is not Britain's staff of life in war time.

¹ By the late Sir William Horrocks.

Clinical and other Notes.

A CLOSED SYSTEM OF WATER DISPOSAL BY SURFACE EVAPORATION.

BY CAPTAIN H. B. L. DIXON,

Royal Army Medical Corps.

DURING the past year it has been my experience, as medical officer to a Searchlight Unit, that one of the major problems in the maintenance of good sanitary conditions on searchlight sites has been the satisfactory disposal of waste waters.

The ground in my particular bit of England will not absorb a drop of water except, perhaps, in the uppermost six to ten inches, below which it consists of clay to an unknown depth, and sumps of the usual pattern have been outstanding failures. Larger and deeper sumps have merely postponed the day of overflowing and in wet weather have acted as receptacles for surface water. Herring-bone systems of trenches have been used and discarded. They look ugly, take up too much room, get in the way and have bred flies; and they, too, have filled up and overflowed. Even when filled with rubble and returfed they have discharged waste waters upon the surface at various points, not to the benefit of the site.

By exposing a large surface area to the air and relying upon evaporation the trouble was eventually overcome in a very satisfactory manner, grass and in some cases, flowers being utilized to supply the necessary area. At no time is the waste water itself left naked to the air.

A large shallow sump is first prepared and, for reasons which will become apparent, this is usually circular in shape. For a site with a personnel of eighteen it should not be less than eighteen feet in diameter and, where water is laid on to the site, not less than twenty-four feet, as more water is invariably used on such a site.

It is essential that its floor should be precisely in the horizontal plane in order that water can maintain an even depth at all parts. It need be no more than one foot in depth, though it is obvious that on sloping ground deeper excavation will be required at the upper aspect of the sump, in order to attain a horizontal floor.

On flat ground the excavated soil can be carted away. On sloping ground it, or part of it, should be neatly banked around the upper margins to form a buttress against flooding by surface waters in wet weather.

A field drain is laid upon the floor, in trident form, from the point of entry to the more outlying parts of the sump.

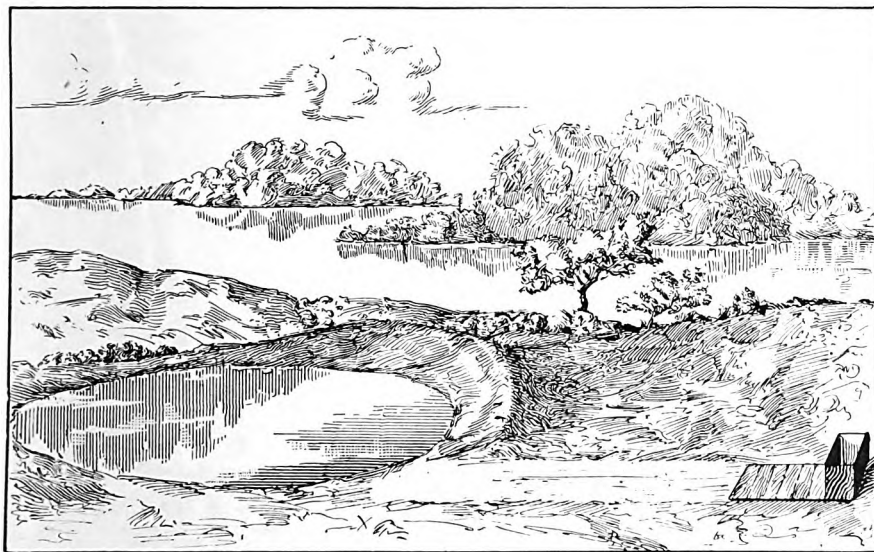
The floor is then covered to a depth of about six inches with small

clinker or rubble which should be firmly pressed in by walking over it or by rolling.

A three-inch layer of cinders mixed with soil is superimposed upon the clinker, and this, too, is firmly walked in.

Finally, a layer of fresh turf is laid upon the soil and, again, this should be rolled or otherwise pressed firmly home. It is well worth while to obtain good quality turf for this purpose rather than to use the (usually) rank grass originally lifted from the spot and in no case should old dry stuff be used.

The sump is now ready for action. It should be nursed a little at first until the turf has obtained good root-hold and care should be taken to maintain the maximum degree of cleanliness in the water which is to enter it, by giving all necessary care to the grease trap.



Sketch showing general view of sump with built-up banking on the upper side, to prevent surface flooding.

As the roots of the turf strike into the wet underlying strata the grass growth soon becomes lush and it has been found advantageous to crop it from time to time and, in fact, to treat it rather as a lawn. It will be seen that water is disposed of by evaporation through the grass blades which, by their number and shape increase the exposed area to a prodigious degree.

For those with a decorative urge, segments of turf can be lifted and replaced by soil, in which flowers usually flourish ; but it is as well to wait for a month or two before disturbing the turf for this purpose.

A further advantage of this type of sump is that, being sealed by turf, it is immune from air-borne contamination and, in my experience, is quite free from any unpleasant smell even when there are no flowers. Far from

becoming malodorous in hot weather it attains its maximum efficiency at such times. What will happen in winter yet remains to be seen; but, in any case, it cannot well become less efficient than any other scheme of water disposal short of direct drainage into a sewer.

A difficulty which will be encountered in preparing such a sump is that of determining when a floor is horizontal. In the first two or three examples which, from force of habit, were made square, it was amusing to see the methods improvised by various D.C.s. One man found that by shutting his eyes and walking about in the sump he could tell when he was going up-hill or down. We gave him the job of tramping the cinders in. Another tested his by rolling a football about and noting any bias it took. A third employed the distinctly messy procedure of pouring water over the floor which rapidly became grimly adhesive as well as very dirty.

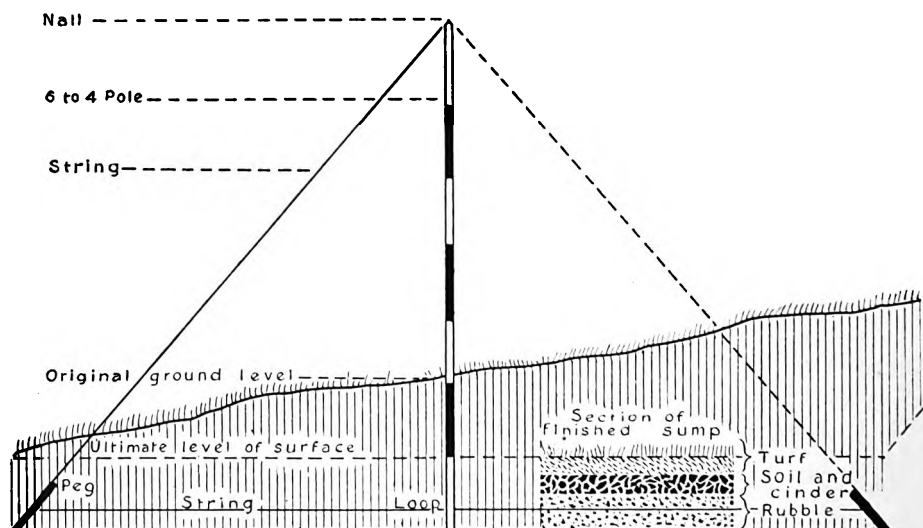


Diagram showing use of 6 to 4 pole and string to obtain horizontal base.

The following method was ultimately adopted :—

Firstly, a peg is driven into the ground at a spot chosen as the centre of the sump.

Secondly, by means of a radial piece of string, a circle is marked out to the size of the sump and digging is at once proceeded with, the peg being replaced by a pole (a 6-to-4 line pole) driven deeply into the ground, as vertically as possible, to mark the centre as digging proceeds.

Digging continues until the sump appears about correct, that is until it is a foot deep at its lower end and anything from two to three feet deep at its uppermost side, according to the slope of the ground, and the floor apparently horizontal. On sloping ground there is an optical illusion that the floor slopes steeply into the hillside.

The pole is then removed and a long piece of string is looped to a nail driven into the centre of the head of the pole.

The pole is then replaced, great care being taken that it is exactly vertical, the string being used as a plumb-line, and is firmly packed in position by stamping the clay hard down around its foot.

The string is then carried to the outer edge of the floor and an object such as a tent peg tied to the string so that its point just reaches the outer edge.

With the peg held in this position, the string is then taken back to the foot of the pole to which it is fastened by a loose loop and forms, as nearly as can be judged, a right angle with the pole.

The string and pole thus form a right angled triangle with the pole as a fixed vertical side and, by carrying the apex (tent peg) around the edges of the floor, keeping the strings taut, it is easy to detect if one portion of the floor's periphery is higher or lower than another.

Having fixed the correct level for the edges of the floor it is not difficult to complete the excavation of the remainder.

A PORTABLE DISINFESTOR.

BY MAJOR R. BENNETT,

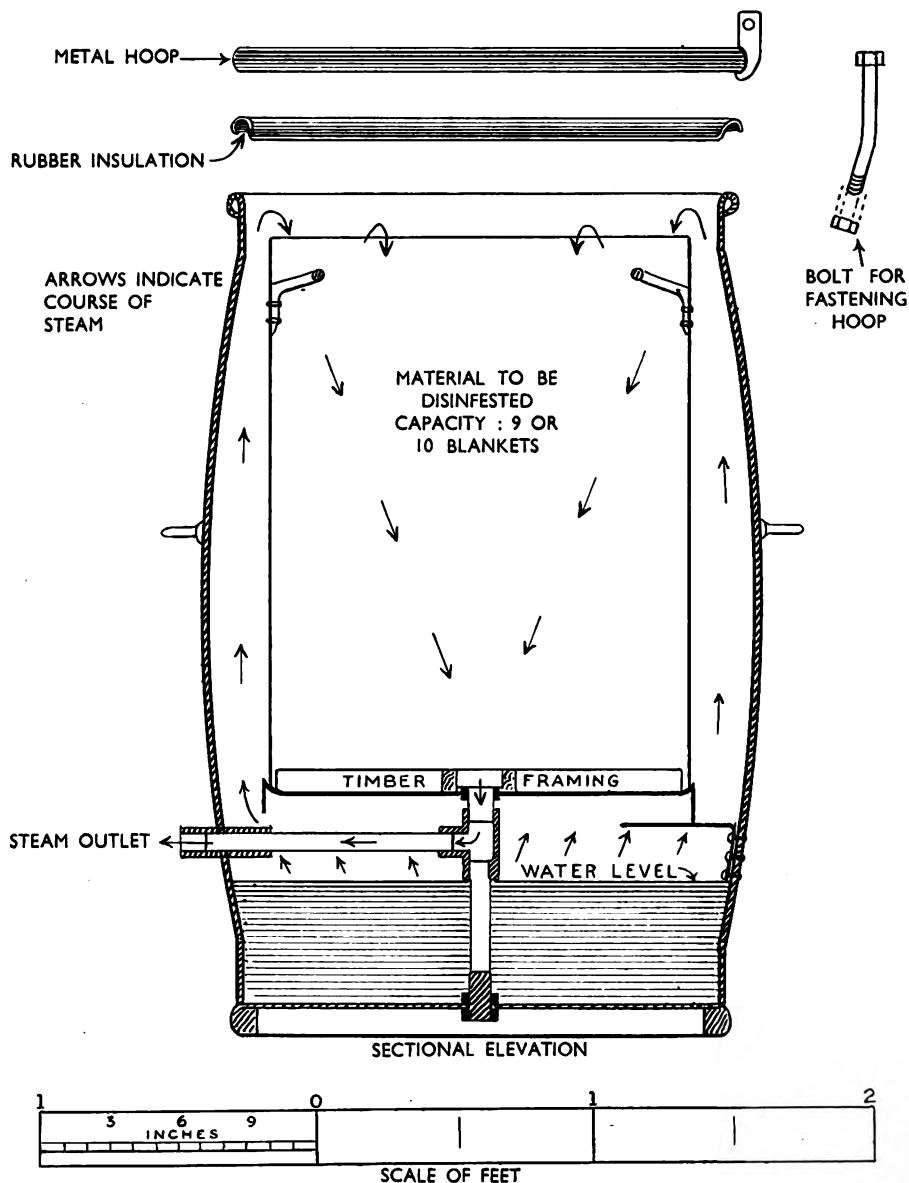
Royal Army Medical Corps.

THE old type of Serbian Barrel disinfestor has several drawbacks and an attempt has been made to construct a model of a similar type but of greater efficiency. To be thorough, disinfestation should be carried out by steam under pressure and using the principle of downward displacement.

The disinfestor described here was made from a steel spirit barrel, an ordinary dustbin and some short lengths of water pipe. The spirit barrel was obtained from a paint factory. It is made of galvanized steel and is provided with an airtight lid with rubber washer and a metal hoop for locking the lid. When fixed in position the lid is perfectly steam-tight. The dustbin used was obtained from Ordnance. The handles were removed and fixed on the inside so that the dustbin would slip inside the steel barrel and rest on angle pieces riveted inside the barrel. Holes were drilled in the base of the dustbin and the side of the barrel to take short lengths of iron pipe and the whole made steam-tight. The construction is best understood by referring to the diagram.

In working the disinfestor, water is poured into the barrel to a depth of about six inches. The whole is then placed on a trench fire and the container filled with the blankets or material to be disinfested. The lid is fixed on and made steam-tight. It is found an advantage to insert some sacking under the lid to protect the rubber washer from the steam.

When disinfestation is complete steam is observed coming from the pipe at the side of the barrel and this should be allowed to proceed for ten minutes. The barrel can then be lifted off the fire by the handles and



the lid removed. If the blankets are shaken out immediately they will be found to dry rapidly.

The capacity of the disinfestor is about twenty blankets per hour. It

has been found to work efficiently and a large number of disinfestations have been carried out with it.

The construction of the disinfestor was entirely carried out by men of a Field Hygiene Section. I am particularly indebted to Serjeant Austin, R.A.M.C., for designing and supervising the construction, and to Private Leitch, R.A.M.C., for drawing the scale plan.

A CASE OF INFECTION WITH *FASCIOLA HEPATICA*.

By MAJOR G. W. B. SHAW,

Royal Army Medical Corps.

AND

CAPTAIN A. J. CLYNE,

Royal Army Medical Corps.

HUMAN infection with *Fasciola hepatica*, the common liver fluke of the sheep, is a rare condition. Stitt¹ quotes some fifty cases as having been recorded. In the circumstances, the following case is of interest :—

Mrs. R. W., aged 30, the wife of a soldier, reported at the British Military Families Hospital, Poona, on May 6, 1940, complaining of an acute stabbing pain of the right upper abdomen, in the region of the liver, for the past week.

She had been in India for ten years, previous to which she had lived in Switzerland.

Nine months before admission she was in hospital with "bacilluria," and three months later for appendicectomy (diagnosed "chronic appendicitis"). On both occasions the main symptom had been vague abdominal pain, chiefly right sided. Two months ago, she was again in hospital with "pain in the abdomen and back," this time diagnosed "myalgia" after X-ray examination had excluded renal calculus. She had been married six years, with one child, aged 5, and had had no abortions or miscarriages.

When admitted, the patient had a temperature of 99·4° F. and pulse 92. She had a small hard painful nodule over the seventh rib in the right anterior axillary line. This nodule was freely movable with apparently no attachment to the rib. X-ray examination of the spine, ribs, lungs and liver region revealed nothing abnormal. The blood examination was as follows :—

Total W.B.C., 10,800 per c.mm.; total R.B.C., 5,480,000 per c.mm.; Hb., 90 per cent; differential, polymorphs, 76 per cent; lymphocytes, 20 per cent; large monocytes, 2 per cent; eosinophils, 2 per cent.

Stool examination showed nothing abnormal. There were no cysts or ova

¹ Stitt, Clough and Clough "Practical Bacteriology, Hæmatology and Animal Parasitology," also Faust in "Human Helminthology" quotes a similar number of cases.

visible. The blood Wassermann was returned W.R. positive + and Kahn negative. This was twice repeated, with the same result.

Because of the Wassermann reaction, the patient was put on a course of potassium iodide and sulphostab injections and the lump on her chest was regarded as possibly a gumma. It however showed no response whatever to the antisyphilitic treatment and three weeks after her admission it was decided to explore the tumour. During this time she had had repeated attacks of pain on the right side of the chest and the lump was very tender. On several occasions she had low evening fever.

An incision over the tumour revealed a mass of inflamed subcutaneous tissue, in the centre of which was a live flat worm. The inflamed mass of tissue was excised and no evidence of any track leading to deeper structures could be found. The operative diagnosis was "an inflammatory swelling due to the presence of a flat worm resembling a liver fluke." Subsequently the fluke was identified at the Southern Command Laboratory as *Fasciola hepatica*.

The patient was kept in hospital a further three weeks during which time two courses of emetine were given. Careful questioning failed to disclose any possible source of infection. Repeated stool examination failed to reveal any ova of *Fasciola hepatica*. She had no further pain and another X-ray of the liver region showed nothing abnormal. She was discharged, to report periodically for observation.

The interesting features of the case were :—

1. What was the extent of her infection with liver fluke ?
2. The migration from the liver through the diaphragm and chest wall to the subcutaneous tissues.
3. The positive Wassermann reaction which, in the absence of any history or clinical signs suggesting syphilis, appeared to be due to the fluke infection. The negative Kahn supports this view.

We are indebted to Lieutenant-Colonel A. C. Craighead, I.M.S., for the laboratory examinations, and to Colonel W. L. E. Fretz, the Officer Commanding, Connaught Military Hospital, Poona, for his permission to forward these notes for publication.

THE DOCTOR'S BAG.

BY MAJOR E. A. SMYTH,
Royal Army Medical Corps.

DURING my experience for short periods as locum tenens in ten different general practices in various parts of the British Isles, and as medical officer in charge of families in the Army, I came to the conclusion that few doctors pay much attention to the design and equipment of their "doctor's bag."

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compartments from which equipment can be quickly removed and replaced ; (4) capable of being quickly rearranged to take different types of equipment ; (5) capable of easy cleaning ; and (6) of smart appearance.

Before describing a type of doctor's bag which I think fulfils the above conditions reasonably well, I wish to discuss a few general points concerning the equipment of a bag suitable for general practice.

I consider a vaginal speculum should be included, as the patient's home is a very suitable place to carry out such examinations. If it is carried as a routine, one will get into the habit of using it more often than appears to be general. As regards types of speculum, I find the Casco's type much superior to any other for use in general practice.

In the usual type of general practice, it is wise to carry two throat swabs as a routine. This I feel will often mean the earlier diagnosis of acute serious conditions of the throat, eye, etc. For instance, when seeing a "doubtful throat case," there seems to be an unconscious tendency to consider the case unlikely to be diphtheria, if without a throat swab. If a throat swab is conveniently available it will be used, affording great peace of mind and protection for both the patient and the doctor.

The bag would be equipped still more efficiently if it contained a couple of blood slides, enabling a smear to be made from throat, eye, urethra, cervix, etc. In many cases the swab has dried and is of little or no value by the time it reaches the pathological laboratory, whereas a smear will remain good for days.

I recommend the carrying of an electric auriscope. In many cases the auriscope will be of little value owing to wax in the meatus or the presence of a discharge. So one should really also carry a small ear syringe, or at least a silver probe on which a little cotton-wool can be applied, or special wooden "probes." Many different types of auriscopes, usually in the form of combined auriscope and ophthalmoscope, are on sale. Most of these auriscopes have the bulb situated in the part to which the speculum is attached. Practically all these instruments give a bright dazzling light, and consequently an unsatisfactory view of the tympanic membrane. The best electric auriscope I have seen is the Rayner type. It is a combined auriscope and ophthalmoscope. The bulb is in the handle, just at the top of the battery, and the light is reflected into the speculum by a system of mirrors, giving an excellent view of the tympanic membrane. The ophthalmoscope is equally good. Many firms produce cases containing ophthalmoscope, auriscope, nasal speculum, spatula, etc., but I find the extras, i.e. nasal speculum, spatula, etc., of little value.

In China I have had the opportunity of being able to experiment with different types of bags much more cheaply than would be the case in England. As a result of these experiments I have produced a bag which I hope may be of use to some general practitioners and officers of the Royal Army Medical Corps.

The bag is capable of carrying, when fully packed, enough equipment to deal with most conditions (excluding major surgery) in general practice.

For normal routine visits, when the equipment is reduced, it becomes a reasonable bag as regards weight, size, and shape for carrying short distances. It is capable of carrying a pair of obstetrical forceps enabling it occasionally to be used as a combined midwifery and general bag.

Roughly the bag is as follows: An oblong five-ply wood box, 17 inches long, $7\frac{1}{2}$ inches high, and $6\frac{3}{4}$ inches broad, these being the outside measurements. Inside the box has three trays, numbered One, Two, and Three. It opens by a lid on the top, and on opening the lid one sees Tray No. 1, which, when equipped, appears as in the following photograph (fig. 1).

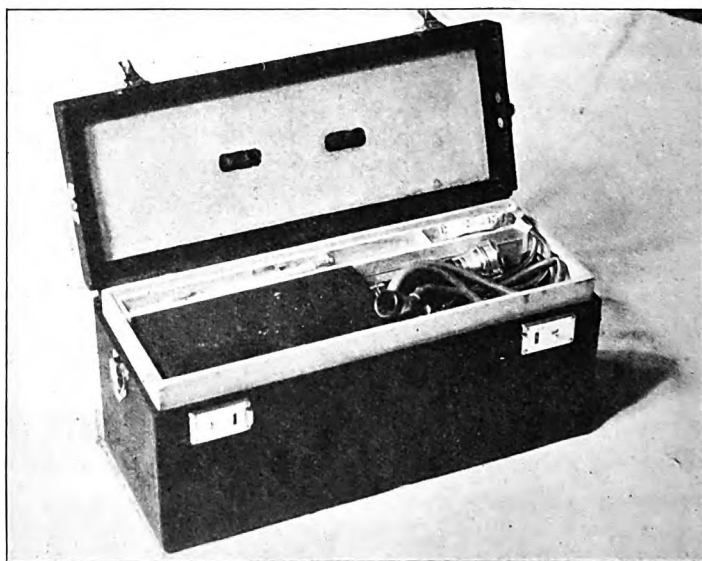


FIG. 1.—At the back can be seen small compartments for thermometer, blood slides, tape measure, etc. In front, black case (containing auriscope and ophthalmoscope) and stethoscope, torch, etc.

The small compartments at the back, holding thermometer, blood slides, and tape measure, consist of one long tray (1A) divided into three compartments.

This small tray is inside Tray No. 1 and lifts out of the latter, leaving underneath a similar tray (1B) which is divided into two compartments, each containing a throat swab. This tray also lifts out of the No. 1 tray so that these two small long trays lie one on top of the other inside Tray No. 1. They are kept in position by a ledge of wood attached to the inside of each end piece of Tray No. 1.

Tray No. 1 (including the two small trays just described, which fit inside it) is made of five-ply wood.

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The inside measurements of Tray No. 1 are 16 inches long, $5\frac{3}{4}$ inches broad, and $2\frac{1}{4}$ inches deep. The inside measurements of the bottom small tray (1B) are $15\frac{1}{2}$ inches long, 1 inch broad, and 1 inch deep. The inside of this tray (1B) is divided into two equal parts by a partition in the centre, making each compartment with inside measurements of approximately $7\frac{5}{8}$ by 1 by 1 inch, which is a convenient size for holding a throat swab.

The inside measurements of the top small tray (1A) are $15\frac{1}{2}$ by 1 by $\frac{3}{4}$ inches and this is divided into three compartments of (1) $7\frac{1}{2}$ by 1 by $\frac{3}{4}$ inches (for thermometer and pencil); (2) $3\frac{3}{4}$ by 1 by $\frac{3}{4}$ inch (for four or five blood slides); and (3) also $3\frac{3}{4}$ by 1 by $\frac{3}{4}$ inches for any small extras such as a roll of measuring tape, spare key of bag, etc.

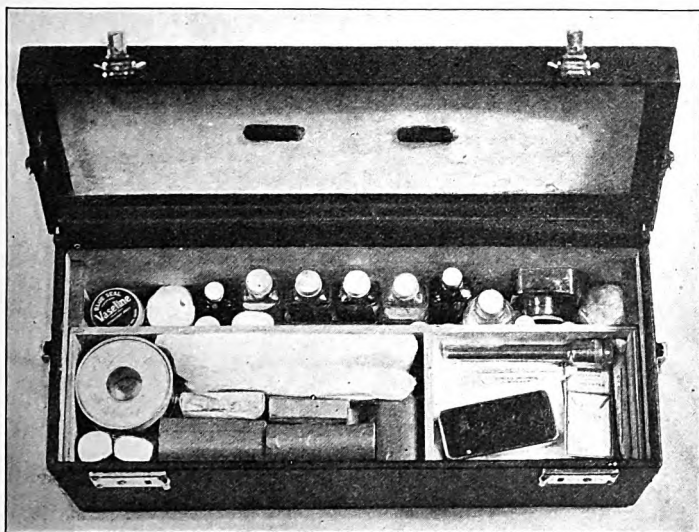


FIG. 2.—Tray No. 1 has been removed. Compartment 2A contains dressings. Compartment 2B contains syringe, suture material, and needles, etc. The bottle compartment is now clearly visible.

When the two small trays (1A and 1B) are in position inside Tray No. 1, the space left in the big tray No. 1 is 16 by $4\frac{1}{4}$ by $2\frac{1}{4}$ inches. This space conveniently holds a case containing a Rayner's combined auriscope and ophthalmoscope, leaving sufficient space for stethoscope, torch, prescription book and spatula, or packet of wooden spatulas.

If more room is needed, as in the case of a different model ophthalmoscope and auriscope, then the two small trays (1A and 1B) can be removed from Tray No. 1, and the swabs, slides, etc., kept in the bottle compartment, to be described later, or carry the ophthalmoscope and auriscope without their case, thereby allowing the small trays to remain inside Tray No. 1.

The general idea of the arrangement and equipment of the top tray (No. 1)

is that in most general practices 50 to 70 per cent of the patients can be examined during a tour of visits without going beyond the top tray.

On removing the top tray (No. 1) from the bag, Tray No. 2 (which lies immediately under Tray No. 1) comes into view. The inside measurements of Tray No. 2 are 16 by $3\frac{7}{8}$ by $1\frac{1}{2}$ inches, this space being divided into two unequal compartments, 2A and 2B. Compartment 2A measures (inside) $10\frac{1}{4}$ by $3\frac{7}{8}$ by $1\frac{1}{2}$ inches, and Compartment 2B measures (inside) $5\frac{1}{2}$ by $3\frac{7}{8}$ by $1\frac{1}{2}$ inches.

The larger compartment (2A) is intended for dressings. It will hold approximately the following: 2 3-inch bandages, 1 2-inch bandage, 2 1-inch bandages, small roll of lint, 1 10-yard roll of 1-inch adhesive strapping, 2 or 3 small packets of Parke Davis compressed sterile cotton wool, several elastoplast "patch" dressings.

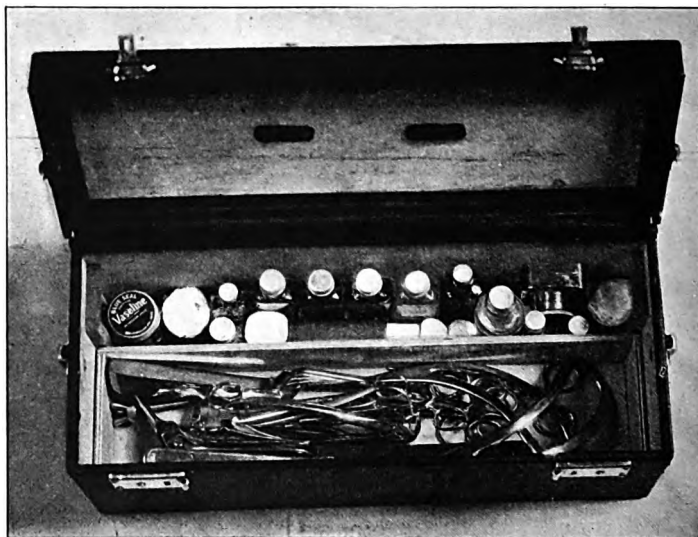


FIG. 3.—Trays No. 1 and No. 2 having been removed, shows Tray No. 3 full of instruments.

The smaller compartment will conveniently hold approximately the following equipment: 1 1-c.c. syringe, or case of combined 1-c.c. and 10-c.c. syringes, phials of dangerous drugs, ampoule of pituitrin, ampoule of coramine, ampoules of anti-tetanic serums, ampoule of anti-diphtheritic serum, few suture needles, 1 tube catgut, 1 tube silkworm gut.

Tray No. 2 is also made of five-ply wood. Dressings, syringes, dangerous drugs, etc., can be quickly found and removed and replaced without any meticulous packing. It also allows for great variation in the quantity and types of equipment and dressings carried.

Tray No. 2 lifts out as easily as No. 1 Tray, bringing Tray No. 3 immediately into view, as all three trays lie one on top of the other. Tray No. 3, or bottom tray, measures (inside) 16 by $3\frac{7}{8}$ by $2\frac{1}{2}$ inches.

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B	BERIN	Pure vitamin B ₁ (aneurin) as a sterile aqueous solution for injection, and in tablets for oral use. Indicated in treatment of neuritis, anoxia, gastro-intestinal diseases and whenever the diet needs a supplement of vitamin B ₁ .	Tablet, 1 mg. Ampoule, 1 cc., 2 mg.	Tablets, bottles of 25, 100 and 500. Ampoules, boxes of 6 x 1 cc., 12 x 1 cc., and 50 x 1 cc.
	PELONIN <i>Nicotinic Acid Glaxo</i>	For the parenteral or oral treatment of pellagra or pellagrinoïd symptoms, e.g. Vincent's Disease and stomatitis.	Tablet, 50 mg. Ampoule 2 cc. 50 mg.	Tablets, bottles of 25 and 100. Ampoules, boxes of 6 x 2 cc., and 12 x 2 cc.
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This tray can be made of five-ply wood. If made of enamel or aluminium all the instruments, gloves, etc., that it may contain can be quickly sterilized in cases of urgency by filling the tray with an antiseptic solution such as dettol.

As both Tray No. 2 and Tray No. 3 are each $3\frac{7}{8}$ inches wide (inside) or $4\frac{1}{4}$ inches (approximately) outside, they will lie accurately one on top of the other (inter-changeable). As the inside measurements of the empty bag without trays is $16\frac{1}{2}$ by 7 by $6\frac{1}{4}$ inches, it can be easily seen there will be a long narrow space left between Trays No. 2 and No. 3 and one side of the bag. This space will measure approximately $16\frac{1}{2}$ inches long, 2 inches wide, and $4\frac{1}{2}$ inches deep. This space is intended chiefly for bottles.

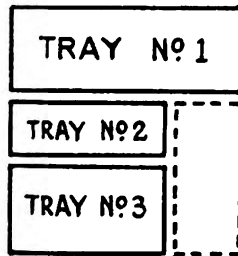


Diagram of the trays lying as they would when inside the bag. A space shown enclosed by dotted lines will then exist between the trays and the inside of the bag. This space is the bottle compartment.

After removal of the top tray, this space will be exposed and any bottle or other equipment it may contain can be quickly removed and replaced. The bottle compartment will take nearly any shape of bottle which is not more than $4\frac{1}{2}$ inches tall. When completely filled with bottles, they pack firmly. If only a couple of bottles are carried they can be secured in position by filling the remainder of the space with about a $\frac{1}{4}$ lb. of a standard length roll of cotton-wool, or bandages standing vertically, as shown in fig. 3.

If desired, this compartment can be easily converted into a number of small compartments to take standard-sized bottles. Personally I prefer to leave the compartment unaltered so that it is adaptable to take bottles, test tubes, ethyl chloride, spirit lamp, etc.

The bottle compartment, when full, is capable of holding approximately the following equipment : Bottle of iodine ; bottle of surgical spirit ; bottle of concentrated antiseptic, e.g. dettol ; bottle of chloroform or ether, or one of each ; small jar of concentrated antiseptic tablets ; small jar of vaseline ;

small bottle of Benedict's or Fehling's solution ; small bottle of acetic acid ; a couple of test tubes in a case ; a spirit lamp, if of small pattern, or the flat metal type ; a bottle of local anæsthetic ; an ethyl chloride container ; a few small extras.

Trays Nos. 2 and 3 are kept in position in the bag by a small ledge of wood, attached to each end piece of the bag. A portion of this ledge can be seen adjacent to jar marked " vaseline " in fig. 3.

This ledge is made of a piece of wood about $\frac{1}{2}$ inch in breadth and thickness. It is screwed on to each end piece of the bag and consists of a vertical portion and a horizontal portion.

The vertical portion keeps the Trays Nos. 2 and 3 in position, thereby allowing the bottle compartment to exist. The horizontal portion prevents the top tray (No. 1) from descending into the bag further than approximately half the depth of the tray. The upper half of Tray No. 1 therefore projects above the edge of the open bag as shown in fig. 1. This idea allows the top tray to be removed and replaced more quickly. The ledge also helps to secure Tray No. 1 and allows the bag to be used with only the No. 1 Tray, the No. 2; or the No. 3 Trays, or both trays being excluded altogether from the bag. If Trays Nos. 2 and 3 are not in use, the whole space under Tray No. 1 can be arranged to one's own personal requirements.

When all three trays are removed, the bag is then an empty box except for the small ledge projecting $\frac{1}{2}$ inch from each end piece. The bag and all its trays are therefore easily cleaned.

The inside measurements of the empty bag are $16\frac{1}{2}$ by $6\frac{1}{4}$ by 7 inches deep. Of the 7 inches in depth, approximately $1\frac{1}{8}$ inches of this is included in the lid.

The inside of the bag and the trays are unlined, which I find excellent for cleaning and rough wear.

The bag is covered with thin good quality black synthetic leather. The lid is attached by three small strong hinges. It has two locks in front, and a metal clip catch at each end to relieve the strain on the hinges and locks. A strong leather handle is fitted to the lid.

The measurements I have given are not sufficiently accurate for the bag to be constructed without due care. I suggest that the trays be constructed first, and then the bag, in the form of a five-ply wood box, made to take the trays accurately. The projecting ledge is then fitted to the inside of each end piece of the bag in such a way as to keep Trays Nos. 2 and 3 in position and yet allowing them to slide up and down freely, during removal and replacement. Finally the outside of this " box bag " is covered with thin synthetic leather, and hinges, locks, catches, and handle fitted.

I have previously stated that this bag is of reasonable size and of smart appearance, but it is naturally heavy when containing all the equipment I have mentioned it to be capable of carrying. No general practitioner normally wishes to carry such a large amount of equipment. The general idea of this bag is : (1) That it can when necessary carry more or less all

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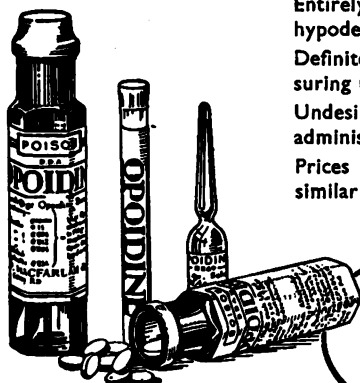
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Finally, if any of my readers like the design of the bag, but require a smaller and lighter type, then I recommend a bag with the following approximate measurements.

Tray No. 1 inside measurements : 12 by $4\frac{7}{8}$ by 2 inches. Small trays 1A and 1B are fitted at one end instead of the back.

The inside measurements of top small tray (1A) are $4\frac{3}{8}$ inches long by 1 inch wide by $\frac{3}{4}$ inch deep, for blood slides, tape measure, etc. The bottom small tray (1B) of same size for thermometer and pencil, etc.

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Tray No. 3 inside measurements : 12 by $3\frac{7}{8}$ by $1\frac{1}{2}$ inches. This tray is one long compartment, and if made of enamel or aluminium can be used as a sterilizer.

When a bag is constructed to hold these trays, the bottle compartment will measure $12\frac{1}{2}$ inches long, 1 inch wide, and $3\frac{3}{4}$ inches deep.

I suggest that equipment be arranged in this bag as follows:—

Tray No. 1.—Stethoscope, torch, thermometer, blood slides, spatula, auriscope (without case), and prescription book.

Tray No. 2, Compartment 2A.—Casco's vaginal speculum, scissors, artery forceps, scalpel, dissecting forceps, probe, and a pair of rubber gloves.

Tray No. 2, Compartment 2B.—1 c.c. syringe, few phials of dangerous drugs, and a few suture needles and suture material.

Tray No. 3.—Dressings and bandages, etc.

Bottle Compartment.—Two throat swabs (each in case), small bottles of iodine surgical spirit, concentrated antiseptic tablets, aspirin, cascara, and a small box of vaseline.

The outside measurements of the finished bag will be roughly 13 inches long, $5\frac{7}{8}$ inches broad, and $6\frac{1}{2}$ inches in height.

This bag will probably be more suitable for the general practitioner with a town practice and the majority of officers of the Royal Army Medical Corps.

My thanks are due to Lieutenant-Colonel C. F. Burton, M.C., R.A.M.C., Officer Commanding British Military Hospital, Shanghai, for permission to submit this article for publication and for helpful criticisms, and to Mr. R. V. Dent, of the Henry Lester Institute, Shanghai, for his excellent photographs.

Current Literature.

FALLON, M. Lung Injury in the Intact Thorax, with Report of a Case.
Brit. J. Surgery. 1940, July, v. 28, 39-49. [Numerous refs.]

This paper is not concerned with war injuries but calls attention to the important fact that the lung may be seriously damaged by accidents which do not apparently damage the chest wall or the parietal pleura.

The author describes a case which occurred in his own practice. It was that of a medical student who was boxing and who lost his fight after being "down" on several occasions. His symptoms were delayed in onset but he developed pain in the chest and hæmoptysis, and an X-ray showed a cavity in the lower lobe of the left lung with a fluid level. The condition resolved spontaneously.

The mechanism by which these injuries are produced is not known and various theories are discussed. Limón, Pera, Séjour and others consider that the lung, which is filled with air at the time, is compressed and bursts like an inflated paper bag because the air cannot escape quickly enough through the upper air passages. Spasm of the glottis would of course favour such a state of affairs. The morbid anatomy of the injuries varies considerably, but, for purposes of convenience, Lamballe describes three grades of lung damage :—

- (1) A simple tear of the capillaries with the production of ecchymosis (often in the form of sub-pleural hæmorrhages).
- (2) More important vessels torn with real effusion of blood.
- (3) The lung is reduced to pulp in places and there are lesions of the larger bronchi and blood vessels.

The hæmorrhage may be massive and confined to one lobe, and Sauerbruch records a patient who developed gangrene and a putrid empyema. It may be generalized in both lungs, or it may be small, peripheral and circumscribed like the case described by Lilienthal.

Diagnosis is difficult but is usually suggested by the X-ray appearances—which have been carefully described by Santé—a history of recent trauma, and the presence of some or all of the following signs and symptoms, cough, dyspnoea, hæmoptysis and surgical emphysema. The condition often exists in association with hæmothorax, pneumothorax and atelectasis. Lockwood, who had considerable experience of chest wounds in the last war, was impressed by the constancy of hæmothorax in injuries of this type, although he states that at operation one seldom observes bleeding from a contused lung.

As regards treatment Sauerbruch speaks as follows: "No patient must be allowed to die from progressive internal hæmorrhage, nor must the mechanical effects of a pneumothorax continue to threaten respiratory and cardio-vascular function. Otherwise operation is rarely necessary."

[This paper is concerned only with injuries to the lung, but it may be well to state that there are recorded cases of injuries to the heart, the pericardium and the oesophagus occurring in patients whose chest walls were intact. In war surgery such injuries may be produced by blast or crushing and also by missiles which have entered another part of the body and finally lodged in one of the thoracic viscera. Note also that an injury to one side of the chest may result in damage to the other side.]

N. R. BARRETT.

Reprinted from "Bulletin of War Medicine," November, 1940.

GOLDHAHN, R. Erfrierungen. [Frost-bite.] *Deut. med. Woch.* 1940, Jan. 19, v. 66, No. 3, 58-61.

A brief review of prevention and treatment of frost-bite. For the proper handling of frost-bite it is necessary to recognize not only the three degrees of local change—which roughly correspond with those of burning—but also the more widespread disturbance of the vascular system and its autonomic nerves which leads to vasoconstriction. The purely local effect of cold is not in itself so very important; of chief importance are all those factors which lead to a general reduction of the peripheral circulation and thus aid local cold to produce frost-bite—for example, tight boots, constricting leggings and more general factors such as immobility and disease.

Frost-bite is prevented by diminishing heat loss by means of non-conducting clothing and the avoidance of all factors reducing blood flow. A practical difficulty is that the stouter the boots the more readily local constriction occurs. Since poor heat conductors lose their property by becoming wet, boots should be well greased. Waterproof materials increase the secretion and accumulation of sweat and so lead to dampness. Sweating feet should be treated by frequent baths and the application of formalin (10 per cent solution or 20 per cent formol vaseline). Frequent changes of footwear are important but difficult to ensure under war conditions. It should be remembered that the change from thin summer to thick winter socks may render a well-fitting boot too tight. The best footwear is hide with fur inside.

Continued movement is necessary to promote local blood flow. If duties involve immobility, reliefs should be more frequent. Small doses of alcohol should be used only when exposure to cold is brief, and the men can return to warmed rooms. Large doses of alcohol are dangerous in severe weather, leading to fatigue, lack of movement and vasomotor paralysis and thus to increased heat loss.

In the treatment of frost-bite, the usually stressed need for careful transport to avoid breaking frozen limbs is not important. Frozen fingers and ears may break like glass, but the freezing of whole limbs to this extent indicates imminent death.

Patients should be brought into an unheated room and gradually warmed. The frozen part may be rubbed with snow; cold towels may be applied

and followed by gentle friction. Immersion in a cold and gradually warmed bath is also suitable. After thawing, the skin is dried and powdered.

If digits become blue and swollen by the extravasation of blood, deep incisions are recommended. Partial elevation promotes the venous return. Bier's passive congestion to promote hyperæmia is not suitable, as it succeeds only with a normal vascular system. In the absence of gangrene, the frost-bite may be treated by alternate hot and cold baths repeated night and morning. The water should be as cold and as hot as can be tolerated and the limb immersed in the cold for only 5 seconds and in the warm for 2 minutes. Oak bark may be added to the water. If necrosis has occurred the part must be kept dry to avoid moist gangrene. With gangrene there is also a persistent, cyanotic œdema of the neighbouring parts which interferes with healing. So far as possible the vasoconstriction must be relieved by vasodilator remedies. Padutin may be used but its effect is uncertain and may be delayed.* More rapid vasodilatation may be ensured by nerve or spinal anæsthesia or by sympathectomy. Spinal anæsthesia is advised for the lower limbs.

R. T. GRANT.

Reprinted from "Bulletin of War Medicine," November, 1940.

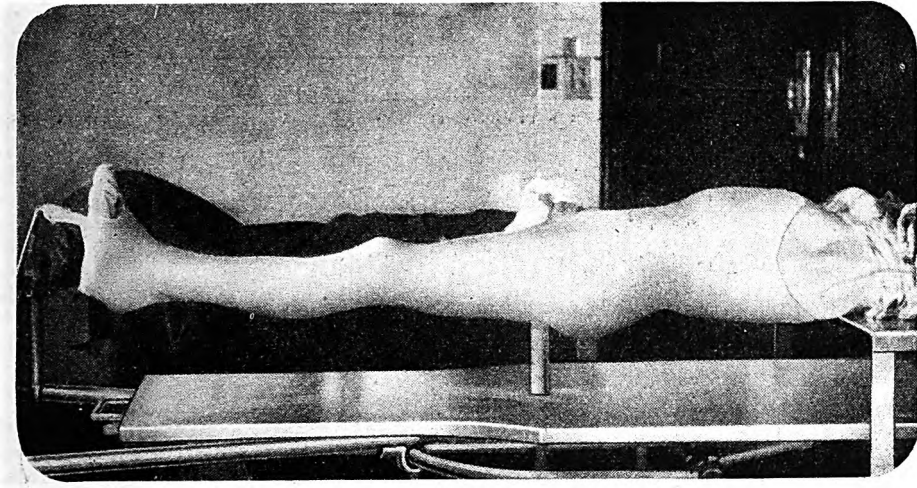
Reviews.

THE NEUROSES IN WAR. By Several Authors. Edited by Dr. Emanuel Miller (now Major, R.A.M.C.). London: Macmillan & Co. 1940. Pp. xii + 250. Price 10s. 6d.

Psychological disorders tend to be something of a puzzle to the average medical man, since medical training in past years was unable to keep pace with the development of knowledge in this field. This volume, by a group of authors, most of whom have practical experience of psychological problems dating back to the war of 1914, attempts to summarize accepted diagnosis and therapeutic knowledge in relation to neuroses. It should be of the greatest value.

The opening chapter, with a subsequent bibliography, gives a survey of the best-known British, American, French and German publications on the neuroses of war. Three following chapters are on the mode of onset of neuroses and on the varied way in which these disorders may first present themselves to the regimental medical officer. The next three chapters deal with the clinical types, differential diagnosis and psychopathological background of this group of disorders, and attention is paid to such topics as the physiological disturbances of emotional origin popularly known nowadays as psycho-somatic disorders, and the differential diagnosis between various "organic" disorders that present psychological symptoms and true neurosis.

* [According to Martindale's *Extra Pharmacopœia*, padutin is a preparation of a vasomotor hormone from the pancreas. It may be given either orally or by intramuscular injection for Raynaud's disease and conditions associated with angiospasm.—ED.]



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Treatment is dealt with in the next three chapters, of which the first contains a dramatic description of the work of an advance psychiatric centre which attempted to treat neuroses behind the front line in the last war. It is followed by detailed description of the use of suggestion and hypnotic analysis—a method which proved particularly valuable in dealing with the more acute emotional disturbances found on active service. The third treatment chapter deals with the general approach to a patient with neurosis, and describes the general principles of psychotherapy. The manual proper concludes with a historical survey of psychiatric services as developed in different European armies, with some observation on the applicability of these principles to current problems. There is an interesting discussion on the nature of, and differences between, civilian and military morale, and lastly, a summarizing chapter which attempts to draw general conclusions. The important appendices contain the gist of the report of the War Office Committee of Enquiry on Shellshock (1922), a description of the E.M.S. treatment facilities for civilian psychoneurotic casualties, a classification of psychological disorders commonly found in war and an epitome of psychiatric pharmacology, including the use of evipan. There is a bibliography of over two hundred items and an index.

The volume seems to have avoided, to a rather unexpected extent, the difficulties implicit in multiple authorship, though the editing and proof reading will be improved in a second edition. It is written with a minimum of technical language, and, although there can be little question that some parts of it might be extensively elaborated in the light of more recent knowledge, it seems to fulfil its purpose of introducing the average medical officer to a field of medicine where guidance is not easily obtained. Few will think their half guinea ill spent on this book which might well be a work of reference for all medical units.

THE ANATOMY OF THE EYE AND ORBIT. 2nd edition. By Eugene Wolff, M.B., B.S.Lond., F.R.C.S.Eng. London: H. K. Lewis & Co., Ltd. 1940. Pp. x + 374. Price 31s. 6d.

This work on the anatomy of the eye and orbit has now become well known as providing in a simple and concise form the essentials on the structure, development and phylogeny of the eye, its adnexa and its central nervous connections. In the second edition, which has now appeared, little change has been made in the text apart from the section on the blood-supply of the visual pathway, which has been re-written to embody the author's valuable original observations: as in the previous edition, not the least of its merits are the many references to points of medical and surgical importance which depend on anatomical features. The greatest value of the work, however, lies in its illustrations which are liberal in number, excellent in quality and extremely informative in design. In this second edition some sixty have been added, the great majority of which have either been drawn by the author or prepared from his microscopic

sections. Some of these are excellent, of particular interest being the preparations of the retina. The appeal of a monograph of this type is, of course, restricted ; but for the student and specialist it is unique in English literature.

S. D. E.

THE PSYCHOLOGY OF FEAR AND COURAGE. By Edward Glover. Penguin Books, Ltd. 1940. Pp.128.

This booklet, produced mainly from material for broadcasting by the B.B.C., is written in language understandable by the layman not versed in the science of the psychology of fear and courage.

The common-sense lines taken up by the author should do much to allay the fears of any interested reader in these times of stress.

INJURIES OF THE JAWS AND FACE, with special Reference to War Casualties. By W. Warwick James, *O.B.E.*, F.R.C.S., L.D.S.Eng., and B. W. Fickling, F.R.C.S., L.D.S.Eng. London: John Bale & Staples Limited. 1940. Pp. xi + 200. 194 Illustrations. Price 15s., postage 6d. extra.

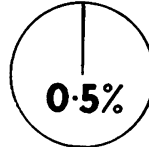
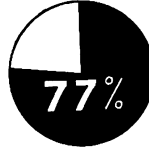
Ever since the war clouds burst over Europe, dental officers of the fighting and emergency medical services have wished for an up-to-date reference book on war injuries of the jaws, written from the essentially dental aspect by an author of extensive experience. The available literature on the subject, dating mainly to the last war, is limited, scattered and not readily accessible, while the valuable Report of the Army Advisory Standing Committee on Maxillo-Facial Injuries (1934) is confined by terms of reference to a brief outline of general principles. This book is, therefore, most opportune, and the authors are to be thanked for this concise, practical guide, which should be studied by every dental officer, and, with advantage, by all medical officers. It was a major dental tragedy of the Great War that the authorities, with the lapse of time, ultimately destroyed the case histories, radiographs and photographs of the thousands of jaw cases treated at the various home hospitals when these closed down, and it was a happy thought of Mr. James to preserve for future study some odds and ends of material of his cases at the Third London General Hospital, for the book is mainly based on his collection. Only those who have attempted to piece together disconnected notes, radiographs, models and appliances, frequently without identification and date, can truly appreciate the labour and patience required, and the several months taken for the analysis of the material and preparation of the book are readily understood. Starting with organization, the specialized nature of the injuries and the necessity for trained particular teams to deal with them at the outset are stressed. The significant anatomical features which influence the character of the injury, its diagnosis and treatment, physiology of bone repair, radiographic technique and interpretation, are next considered, followed by the impact effects of missiles on the soft and hard tissues, with the types of wounds produced, a thorough

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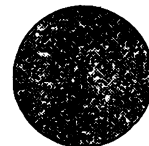
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understanding of which is essential for successful treatment. The bulk of the book is then given to emergency, preliminary and special treatments, so extensively illustrated and lucidly described that the whole sequence from time of wound is easily followed, and these will be the chapters most closely studied. So wide a field permits of much variation in operative and prosthetic procedure and techniques favoured by the authors are given due prominence, though the alternatives are also considered. Eyelet interdental wiring is recommended whenever possible, and there is no doubt it is coming increasingly into favour, especially in the preliminary stage. The illustrated appliances and supports for the hard and soft tissues are models of prosthetic ingenuity, skill and delicacy. Complications are outlined and effective treatment, including chemotherapy, described, while a chapter is given to the bone grafting technique developed at the Third London General Hospital, the book closing with a valuable statistical analysis of the material on which it was prepared. A particular feature which will be much appreciated is the large number (194) of illustrations, including several of cases twenty years after treatment. These are of the utmost instructional value and greatly enhance the practical guidance which was the object of this book's preparation and which will contribute markedly to its undoubted success. The general setting-up of the book is also a matter for compliment—large, clear type on excellent paper, subdivision into paragraphs with prominent headings, and large illustrations. Lastly, in these days of mounting costs of production, the price of fifteen shillings is reasonable. The success of this publication is assured and the demand for it should necessitate further editions.

S. H. W.

WAR WOUNDS AND INJURIES. Edited by E. Fletcher, M.A., M.B., M.R.C.P., and R. W. Raven, F.R.C.S. London: Edward Arnold & Co. 1940. Pp. viii + 262. Price 14s. net.

This small textbook, which is based on articles appearing in the *Post Graduate Medical Journal*, by many well-known authorities, forms a welcome and useful addition to the armamentarium of the general surgeon both military and civil.

In its two hundred and sixty pages it deals with war wounds and injuries which are commonly encountered in the various parts of the body. There is an excellent section on wounds of the chest, which will be invaluable to the general surgeon who is called upon occasionally to deal with such conditions and is uncertain, so much has this become a speciality in peace time conditions, how to proceed.

Beautifully illustrated, the subject matter is presented in a sound and concise form. If one might offer one small criticism, it is that the work would be improved by the addition of a chapter or two on wounds of the soft tissues in general and fractures in view of the large percentage of injuries which fall into this class. Perhaps we may hope to see this addition in a further edition of an excellent work.

R. B.

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Jan. 7.—The undermentioned Maj. to be Lt.-Cols. :—

(Temp. Lt.-Col.) R. D. Davy, *M.C.*, *M.B.* (15647). Nov. 27, 1940.

F. McKibbin, *M.B.* (8445). Dec. 8, 1940.

K. M. Nelson, *M.C.* (24819). Dec. 16, 1940.

Short Service Commission.—Capt. T. D. M. Martin, *M.B.* (66502), relinquishes his comm. on account of ill-health. Jan. 7, 1941.

Jan. 17.—Col. J. T. Johnson, *D.S.O.*, *M.D.* (33124), ret. (late *R.A.M.C.*), at his own request, reverts to the rank of Lt.-Col. whilst empled. during the present emergency. Dec. 16, 1940.

Jan. 31.—The undermentioned Capt. (temp. Maj.) to be Maj. :—

P. J. Richards (51985). Jan. 26, 1941.

C. A. de Candole (49751). Jan. 27, 1941.

Short Service Commissions.—The appt. of Lt. D. B. Jagger, *M.B.* (99110), is antedated to Jan. 12, 1939, under the provs. of Art. 39 Royal Warrant for Pay & Promotion, 1940, but not to carry pay and allces. prior to Sept. 3, 1939.

Lt. D. B. Jagger, *M.B.* (99110), to be Capt. Sept. 3, 1940, with seniority Jan. 12, 1940. (Substituted for the notfn. in the *Gazette* of Oct. 22, 1940.)

The appt. of Lt. J. A. Allen, *M.B.* (100136), is antedated to Sept. 4, 1938, under the provs. of Art. 39 Royal Warrant for Pay & Promotion, 1940, but not to carry pay and allces. prior to Sept. 4, 1939.

Lt. J. A. Allen, *M.B.* (100136), to be Capt. Sept. 4, 1940, with seniority Sept. 4, 1939. (Substituted for the notfn. in the *Gazette* of Oct. 25, 1940.)

Regular Army Reserve of Officers.

Feb. 7.—Maj. D. W. John, *M.C.* (51042), ceases to belong to the Res. of Off. on account of ill-health. Jan. 28, 1941.

Capt. B. Malaher (5319), to be Bt.-Maj. Dec. 15, 1940, under the provs. of Art. 168, Royal Warrant for Pay and Promotion, 1940.

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Jan. 17.—Sister Miss R. A. Coombe resigns her appt. Jan. 7, 1941.

Jan. 24.—Matron Miss C. L. A. Robinson, *M.M.*, *A.R.R.C.*, having attained the age for retirement is placed on ret. pay. Jan. 15, 1941.

The undermentioned Sisters resign their appointments :—

Miss M. E. May. Nov. 30, 1940.

Miss J. K. Smith. Jan. 18, 1941.

The undermentioned Staff Nurses to be Sisters :—

Miss M. E. McEwan. Nov. 14, 1940. (with seniority next below Miss E. M. Stonham).

Miss M. G. Harrison. Nov. 15, 1940 (with seniority next below Miss I. E. Paddon).

Miss V. Kelly. Nov. 20, 1940.

Miss M. E. Leitch. Nov. 25, 1940.

Miss E. M. Spreckley. Dec. 1, 1940.

Miss M. R. Treveleyan. Dec. 1, 1940.

Miss M. Caudwell. Dec. 1, 1940.

Jan. 31.—Sister Miss G. Roberts, having

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attained the age for retirement, is placed on ret. pay. Jan. 7, 1941.

Feb. 7.—Sister Miss D. E. Bensley retires on ret. pay on account of ill-health. Feb. 8, 1941.

The undermentioned Sisters resign their appts. :—

Miss F. H. Stewart. Nov. 16, 1940.

Miss W. Kelleher. Jan. 27, 1941.

Miss D. M. Blood. Jan. 30, 1941.

Miss J. N. S. Campbell. Feb. 5, 1941.

The notifi. regarding Sister A. B. P. Smele in the *Gazette* of Jan. 3, 1941 is cancelled.

Staff Nurse Miss F. M. Osborne resigns her appt. Dec. 29, 1940.

The undermentioned Staff Nurses to be Sisters :—

Miss F. I. S. Hedge, Dec. 1, 1940 (with seniority next below Miss M. Hellen).

Miss J. Marchant. Dec. 1, 1940.

Provl. Staff Nurse Miss E. F. Shine is confirmed in her appt.

ROYAL ARMY MEDICAL CORPS AND THE ARMY DENTAL CORPS COMFORTS GUILD.

THERE is not much fresh news to report this month. More parcels have been sent to the Middle East and to units in the United Kingdom.

The Committee would be glad if any unit who is short of any special game, for example, a Dart Board, Deck Tennis, Chess, etc., would write to the Honorary Secretary. This also applies if there is a real shortage of knitted comforts. We ask for this information, as it is impossible to supply everyone at present, and it would make our task much easier if units would co-operate in this way.

We are glad to say that more knitting parties have been formed during the month. We hope to collect, during the Spring and Summer, a large supply of woolies for distribution in the Autumn. We cannot have too many knitters.

May we ask again for books and playing cards. The response to our last appeal was practically *nil*.

The Committee would like to thank once again all those who are working so splendidly for the Guild. If they could see the appreciative letters we receive, they would feel rewarded.

DEATHS.

FALKNER.—On October 9, 1940, in Malta, Lieutenant-Colonel Percy Hope Falkner, R.A.M.C., F.R.C.S.I. Born in Bray, Co. Wicklow, February 16, 1876, he was commissioned Lieutenant July 27, 1899, and retired March 23, 1926. In the South African War he took part in the Relief of Ladysmith, being present at the actions at Colenso, Spion Kop, Vaal Kranz, operations on Tugela Heights (February 14 to 27, 1900) and the actions at Pieters Hill; also in the operations in Natal March to June, 1900, and the action at Laings Nek (June 6 to 9, 1900). He served in France and Belgium in 1914-1915 being awarded the 1914 Star and Clasp, the British War and Victory Medals. He was brought to notice for valuable services rendered in connexion with the war.

FOWLER.—On January 21, 1941, Colonel Charles Edward Percy Fowler, O.B.E. Colonel Fowler was born in Milverton, Somerset, January 27, 1866. Becoming M.R.C.S. and L.R.C.P. in 1889, he took the F.R.C.S. in 1891, and the D.P.H. Cambridge in 1894. Commissioned as Surgeon Lieutenant July 29, 1893, he became Surgeon Captain July 29, 1896,

Major R.A.M.C. January 30, 1905, and retired February 4, 1914. He was Assistant Professor of Hygiene, R.A.M. College, 1903 to 1907, and M.O.H. and Sanitary Officer, Gibraltar, 1907 to 1912. He accompanied the British Mission to Fez, Morocco, in 1909. Appointed Instructor, Army School of Sanitation, February 17, 1913, he retired February 4, 1914. Recalled to the Active List on the outbreak of war in August, 1914, he was D.A.D.M.S. Aldershot Command 1914 to 1916 and later A.D.M.S. San. with the Egyptian Expeditionary Force. Mentioned in despatches *London Gazette* June 5, 1919, he received the Brevet of Lieutenant-Colonel, the O.B.E., British War and Victory Medals and became Colonel May 8, 1919. He contributed articles to the *JOURNAL OF THE ROYAL ARMY MEDICAL CORPS*.

CLEMENTS.—On January 22, 1941, in Ootacamund, Southern India, Colonel Robert William Clements, C.M.G., D.S.O. Colonel Clements was a graduate of the old Royal University of Ireland, where he took the M.B. in 1894. He took the D.P.H., Cambridge, in 1906, and the D.T.M. and H., Liverpool, the same year. Born in

Pomeroy, Co. Tyrone, April 7, 1870, he was commissioned Surgeon Lieutenant July, 29, 1896, Captain R.A.M.C., July 29, 1899, Major January 29, 1908, Lieutenant-Colonel March 1, 1915, and Colonel December 26, 1917. On his retirement on February 24, 1922, he settled in Ootacamund, where for some years he was Superintendent of the Convalescent Home for Officers. He served in France from September, 1914, till the end of the war, being awarded the *C.M.G.*, *D.S.O.*, 1914 Star, British War and Victory Medals. He was five times mentioned in despatches.

STANISTREET.—On January 26, at Bournemouth. Major-General Sir George Bradshaw Stanistreet, *K.B.E.*, *C.B.*, *C.M.G.*, Born on May 13, 1866, the son of Richard Stanistreet, M.D., he was educated at Windermere College and at Trinity College, Dublin, where he graduated in arts and medicine. Being successful in the competitive examination for a commission in the A.M.S., he entered Netley in 1891 and was gazetted Lieutenant. Sent to India for his first tour abroad, Stanistreet became the personal assistant to the P.M.O., Punjab Command, in 1896; and while holding that office left Peshawar for the North-West Frontier campaign of 1897-98. On reverting to home service in 1902 he was stationed at Southampton on appointment as embarkation officer, with duties that entailed medical supervision of all troops and trooper-transports leaving and entering its docks.

In 1906 Stanistreet was installed as Staff Officer to the P.M.O., Southern Command, with headquarters at Salisbury, and later he held a series of staff appointments at the War Office, beginning in 1913 and continuing uninterruptedly till 1922. These included the posts of D.A.D.G., 1913-17, A.D.G. 1917-18, and D.D.G. 1918-22. The first-named appointment dealt with the collection, distribution, and despatch of all medical and surgical supplies and equipment to British forces engaged on all battle fronts, and to hospitals receiving sick and wounded from the same, Mesopotamia excepted. In 1917 Stanistreet took over the appointment of A.D.G., one which chiefly concerned R.A.M.C. personnel, and in 1918 he became D.D.G. and was promoted Major-General. On retirement in 1922 he was made *K.B.E.*, having previously been made *C.M.G.* and a *C.B.* He was made an officer of St. John of Jerusalem.

DANSEY - BROWNING.—On February 2, at Sidmouth, Colonel George Dansey-Browning, *C.B.E.*

A correspondent writes :—

His service was devoted to the welfare of the soldier and his dependants. The special qualifications he obtained after

joining the Army were sought and gained with that object in view.

“Dansey” was born in November, 1870, and was educated at the Royal Naval School and at the Lorient Lycée, Rennes. He was an accomplished French scholar. A student of the Westminster Hospital he took the diplomas of M.R.C.S., L.R.C.P., and then passed by competition into the Army Medical School, Netley. At his homecomings from foreign service he took opportunities to gain the diplomas of D.P.H. Edinburgh and the D.M.T. of Liverpool, and, lastly, the M.R.C.P. of London. He embarked for China for special service in 1900, being awarded the medal and, after a home tour, was appointed M.O.H. of Gibraltar, where he served during the last war. His labours were chiefly concerned with the prevention and mitigation of diseases incidental to the climate and to the varied and shifting population of a great maritime port.

For his services Dansey-Browning was made *C.B.E.* in 1919 and awarded the French Medal for Epidemics and the British War Medal. In 1922 he was appointed to an administrative post in the United Provinces of India with headquarters at Lucknow; and on retirement in 1928 was selected as the organizing director of the newly formed Enham Village centre for disabled service men. That accomplished, he elected to take over a retired pay billet as medical officer to the troops at Longmoor. There he devoted his days and nights to the soldier and his family. All matters concerning the welfare of mother and child were fostered and dealt with with outstanding merit. His ways were ways of gentleness, with a simple and quiet devotion to the sick and needy, and he will long be remembered as a well-trying and beloved physician.

In 1907 Dansey-Browning married Lillian, daughter of General Stoddart, of the Indian Army. They had a son and a daughter. The son, Major Charles Dansey-Browning, is serving with the R.A.M.C.

JOHNSON.—In Swaffham, Norfolk, on February 4, 1941, Major (Temporary Lieutenant-Colonel) Reginald Johnson, *M.B.E.*, *R.A.M.C.*, M.D. Dublin. Born September 13, 1888, Colonel Johnson was educated at Trinity College, Dublin, where he took the M.B. in 1912, and proceeded to the M.D. in 1914. Commissioned as Temporary Lieutenant January 10, 1916, he became Temporary Captain January 10, 1917. He received a permanent Commission September 1, 1920, and was promoted Major January 10, 1928. He served in France in 1916 and 1917, being awarded the *M.B.E.*, British War and Victory Medals, and the Campaign in Waziristan 1921-1924, being awarded the Medal with Clasp.

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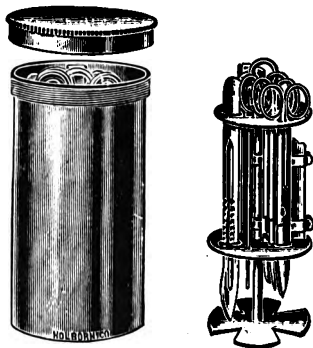
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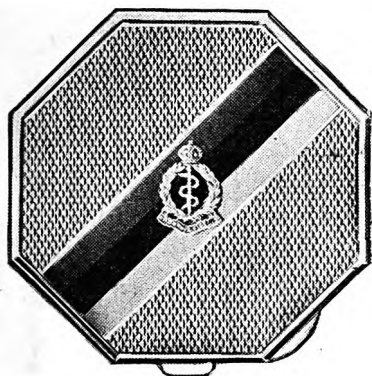
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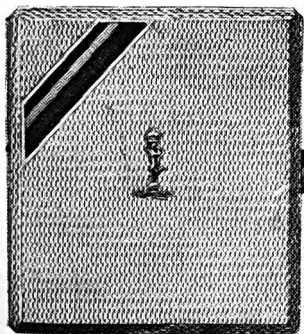
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NOTICE

In view of the great need for rapid diffusion of information in an abridged form it has been decided to issue monthly to all Officers of the Royal Army Medical Corps a short Army Medical Directorate Bulletin. In this Bulletin urgent matters will be brought to the notice of all Medical Officers of the Forces.

Authors are alone responsible for the statements
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Journal
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Royal Army Medical Corps.

Original Communications.

REPORT ON THE SIXTH INTERNATIONAL COURSE IN
MALARIOLOGY, 1939.

BY MAJOR J. J. O'DWYER, M.B.,

Royal Army Medical Corps.

SHORTLY after arrival in Malaya and while visiting a contonment in the course of erection I was asked for advice on the subsoil drainage of the area, on the ideal level of a system of invert drains and on the installation of a tidal gate. Although I had been lucky enough to attend a course of instruction given at the Malaria Institute of India at Karnal in 1929 I had no experience, nor even a vague knowledge, of the way in which these problems should be tackled. Similar difficulties awaited me in the outlying districts where the garrison has been rapidly increased, where fresh buildings are being put up every day, and where large areas are being used by troops for war purposes, manœuvres, and for what might now be called permanent accommodation. It was with great relief, therefore, that I embarked on an anti-malarial course—the Sixth International Course in Malariology run by the League of Nations Eastern Bureau, Singapore.

I shall try to give a short description of the course, and then endeavour to point out some of the lessons which I learnt, and which I trust will be learnt by other officers of the R.A.M.C. and R.E. who attend future courses.

I was unlucky in being unable to attend the first half of this course which was based on the Institute for Medical Research, Kuala Lumpur, and which embraced the study of practical entomology, hæmatology, protozoology and chemotherapy, together with some practical demonstrations on anti-malaria work in rubber estates and jungle and tidal areas in the State of Selangor.

The second part of the course was based on the College of Medicine, Singapore, and consisted of a study of epidemiology and immunity, clinical malaria and pathology, control methods and special studies.

A considerable part of this course was devoted to practical demonstrations and during the first week of the course was attended by engineers from all over the Far East and one representative from the Royal Engineers, stationed in Malaya Command.

The problems which present themselves in Malaya to one responsible for malaria control are mainly two, namely, the control of malaria carrying anopheles in the hilly country and the foothills and the control of malaria carrying anopheles in the tidal and swampy areas, and the whole course was organized to give the delegates an outline of the main principles which rule and guide the practical methods which have been brought to such a pitch of perfection by workers in Malaya.

Colonel Covell, Director of the Malaria Institute in India, gave us a series of lectures in Epidemiology, and I can only say that, as a result of the instruction given in these lectures, even the most stupid of us was able to see the way in which any question of malaria control must be approached. His lectures were illustrated by most interesting facts, statistics, graphs and photographs from India, and the warning he gave us that we must not be optimistic because our control succeeds for one or two years was a most timely one. As he said, the outbreak of an epidemic leads to the initiation of control methods during the years immediately following it when the incidence of the disease would show a progressive fall even if no preventive measures were adopted. Undue credit may then be given to the effects of the campaign and a false sense of security may be engendered which would be rudely upset when the next epidemic arose.

He gave us a complete picture of the necessity for possessing a thorough knowledge of the various factors which influence the spread of the disease and for measuring the amount of malaria in the area under investigation before planning methods of malaria control.

Spleen surveys, theories of the spleen rate, parasite surveys and the infant malaria index were all gone into in a thorough fashion. Epidemic and endemic malaria were explained to us and the problems connected therewith. Perhaps one of his most interesting lectures was that on immunity and the work done in the last ten years on the difference in strains and the difference in man's reaction to them, and the consequent change in our outlook on malaria. It is particularly pertinent to examine this problem closely in Malaya where we have infected Indian troops coming to live and work under conditions which expose them to fresh infections with Malayan strains. Personally, the transition from acute infestation to immune infestation was a revelation to me, and will be of considerable help in assessing the likelihood of Indian troops carrying an acute infection with them from India to Malaya; and the fact that this immunity is maintained only by constant reinfection and superinfection and is comparatively

quickly lost by sojourn in non-malarious areas, should be noted by any health officer in Malaya.

CLINICAL MALARIA.

Clinical malaria and pathology were dealt with by Professor R. B. Hawes of the College of Medicine, at the Tan Tock Seng Hospital, and his series of lectures and demonstrations on the many malaria cases which come from outlying islands around Singapore, which are not malaria controlled, was most refreshing. He gave us a complete picture of the disease in all its manifestations, a most valuable dissertation on the biochemical changes which the parasite brings about in the human being and a most interesting disquisition on the various treatments or combinations of treatment which are at one's disposal to-day. To me his method of treating a severely infected and collapsed case by intravenous injections of quinine sulphate 10 grains, calcium chloride 5 grains, adrenaline 10 minims, and 3 per cent saline, to one pint was quite new, and the saline to counteract the excess potassium in the system seemed to be the most logical method of treatment. It has proved extremely successful in the Tan Tock Seng Hospital and their mortality rate in these severe cases has fallen from 14 to 3 per cent.

Other useful lessons learnt were :—

(1) The test for the presence of atebirin in urine, which will show a lively yellow fluorescence when atebirin is present in the original urine in so minute a quantity as 1 : 100,000. Traces of reactions are recognizable in still higher dilutions.

The technique is as follows :—(a) To 10 c.c. of urine in a test tube add 1 c.c. of a saturated solution of potassium carbonate. (b) Add 1 c.c. of amyl alcohol to this alkalized urine. (c) Thoroughly shake and put aside for a few minutes to allow the alcohol to separate. The alcohol layer contains most of the atebirin, and if the drug was originally present in a concentration of over 1 : 1,000 the yellow coloration of the atebirin can be easily recognized by the naked eye. If the naked eye test is negative the urine is examined by ultra-violet light when the lively yellow fluorescence mentioned above can be seen.

(2) A description of the vital staining of malaria parasites. The best results, he told us, were given by a saturated solution of brilliant cresyl blue in sterile physiological saline. A small drop of this—2 c.mm.—is placed on a slide and a glass cover on which a drop of blood has been placed is dropped on the stain. The preparation is ringed and is ready for examination at once, as staining of the parasite is almost instantaneous. The parasites remain alive for upwards of two hours on the warm stage. It seems that the method will be useful for the study of the relation of the parasite to the reticulocyte and of the action of the drugs.

MALARIA CONTROL.

Control methods occupied the greatest proportion of our time during the period and particularly in the first week when we had the novel experi-

ence of being accompanied by engineers. The difference in approach to problems of malaria control between doctors and engineers was very manifest, and the somewhat inhuman attitude of those who consider that "progress" is shown solely by the building of roads and railways, and not by the happiness of the inhabitants, was rather a shock to the doctors whose more human method of approach seems such a reasonable one. The experience, however, of listening to and, at times, combating the opinions of the engineers, was most valuable and enabled the delegates to the course to appreciate the difficulties that must be overcome when trying to initiate a scheme for the control of malaria.

Our chief instructor was Dr. J. W. Scharff, Chief Health Officer, Singapore, and from the outset his wonderful energy, vigorous personality and remarkable enthusiasm permeated the whole course. He showed us that continuity of policy, persistence and tireless energy in addition to adequate knowledge and receptive brain are necessary to maintain effective malaria control. As I state above, the chief problems which we meet with in this country are two, namely, the control of anopheles in the hills and foothills—rocky ground with outcrops of granite is met with all over Malaya—and control of anopheles in the tidal and swamp areas.

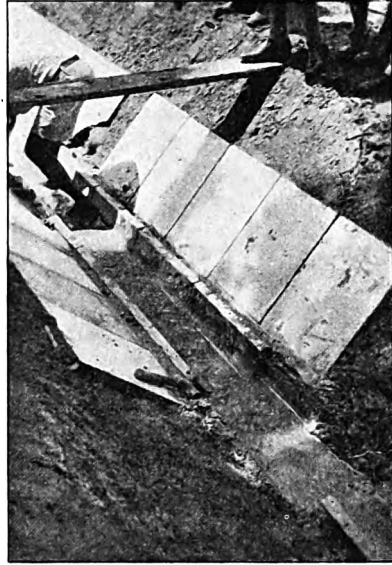
PERMANENT WORK—CONCRETE DRAINS, ETC.

We were first of all shown in the museum and on the demonstration ground outside it various kinds of permanent work which experience has taught are the most effective in draining the storm surface and subsoil water of this country. We were shown examples of well made subsoil drains, badly made subsoil drains, and useless subsoil drains. We were shown how to make concrete, how to test it and how to use concrete in making invert drains, channels and the like. We were shown the common faults perpetrated by unskilled people who do not realize that when dealing with the wily mosquito, strict attention to detail is essential, and that a series of drains well laid with an even gradient, of good material, can be a grave danger if speckled with weepholes badly made, or not made at all, which collect and hold water and, with encouragement, breed *Anopheles maculatus*. I was particularly struck by the necessity for having a thorough knowledge of the elementary principles that govern the laying of drains, the use of boning rods and bench sites, the great appreciation of gradients, and the measures that have to be taken to prevent these extensive concrete channels from being washed away by the heavy storms which are such a common feature of this climate.

The use of grass and turf to strengthen these concrete banks, the use of cement slabs anchored every ten yards by a cube of stone which acts as a key, and a storm water ledge of $3\frac{1}{2}$ inches of concreting which binds the invert to the cement slab, were practical considerations the adequate appreciation of which would save the War Department many hundreds of pounds.



Invert drain, Singapore. Note 1—Working weepholes; 2—Inverts left with open points.



Laying an invert. Note 1—Angle of slabs. 2—Open joints between slabs and inverts. 3—Sand base on which inverts are laid. 4—Keyslabs.



Laying subsoil drains. Note 1—Depth. 2—Collar of properly puddled clay. 3—Top soil first on pipes.

Shortly after I arrived here I was taken out to a new cantonment to see 400 yards of concrete channel which had been washed away in a torrential rainstorm on the previous day. Before I had been on this course it would have been quite idle to ask me what measures should be taken to deal with the situation and when they should be taken. After the course it was quite obvious to me what steps should be taken and when they should be taken. This is entirely due first of all to the demonstrations given to us by Dr. Scharff at the museum, and later demonstrations when he showed us the work he was doing around Bukit Timah Hill and elsewhere on Singapore island. We were taken by the Deputy Health Officer of Singapore Municipality to the Singapore Waterworks at Gunong Pulai in the State of Johore where Dr. Hunter, formerly Chief Medical Officer, Singapore Municipality, had achieved almost complete malaria control in an area where such control was considered by many to be almost impossible.

The problems dealt with at Gunong Pulai are very much akin to those which present themselves to us at Pengerang. Here is the same hilly country, the geology of which is complex almost beyond belief. Layers of clay, laterite, granite and sand are intermingled in the most astonishing fashion, and between these layers water shows itself on the sites of steep hills in the midst of large boulders, or as an oozy marsh in the foothills. The Municipality of Singapore, seeing the necessity of complete malaria control if their large engineering project was to be successful, were willing to expend 10 per cent of the capital outlay on malaria control, and this realization of the necessity to spend money was a primary factor in the success of the venture.

Unfortunately, our commitments at Pengerang are such as to render the cost of similar methods to those adopted at Gunong Pulai out of the question, but it was an experience which showed us how to deal with some of the more dangerous breeding places and gave us fresh ideas about work close to camps in Pengerang and in some out-stations in Penang.

NATURAL METHODS OF CONTROL.

Dr. Nicholas, Health Officer, Province Wellesley, took us for instruction in natural methods of mosquito control. We were shown how to stone-pack hilly streams, and this seemed a very adequate attempt to deal cheaply with problems like those in Pengerang when other methods are out of the question. The dangers to be guarded against were carefully explained to us.

The method is as follows :—First of all the stream is cleaned and cleared of debris leaving a channel about 3 feet deep and anything from 18 inches to 5 or 6 feet wide. Large stones are then chosen to form a channel—one stone at each side and one on top to prevent smaller stones and debris from blocking the channel up. On this rough primary channel large stones are laid. On top of these smaller stones and above them smaller stones again and, finally, either a mosaic of large stones or an earthen plat-

form underlaid with twigs on top of which turfs are placed. When the slope is very steep and the flow of water in storm time liable to be very heavy retaining walls should be built, i.e. the stones in the drains should be cemented together every 10 or 12 yards in order to hold up the smaller stones and prevent the whole drain being swept to the bottom of the hill.

We were then shown examples of fascine drainage and the principles of this were again explained to us by Dr. Nicholas. The drains are made as follows :—

First of all young saplings are laid lengthwise in the drain to a level of 6 to 8 inches above the normal flow. Secondly, twigs are laid crosswise over the drain and, finally, grass evenly cut is laid across the sticks in bundles, the cut end of the grass facing upstream, and the whole laid in the manner of tiles laid on a roof. The whole, after settling down, i.e. after about a week, can be covered with earth and turfed over. We saw drains



Screw-down Tidal Gate between late swamp and sea.

laid in this fashion which were still working well three years after they had been laid. Their action is twofold. The drain is covered in and cannot act as a breeding place and if a portion of a drain remains uncovered the mass of rotting vegetation alters the composition of the water so that *Anopheles maculatus* is unlikely to be able to use it as a breeding place. These drains are unsuitable for hilly country, but are excellent in the plains.

Other methods of natural control were explained to us by Dr. Scharff, and perhaps one of the most interesting was that exemplified in the Botanical Gardens in Singapore, where the weekly changing of 6 inches to 2 feet in the level of the water has had the extraordinary effect of completely inhibiting breeding of mosquito larvæ in any part of the large lake which is a marked feature of these gardens. More important, perhaps, was the method which he first described and then showed us, of making the use

of the tide in lands near the shore where *A. sundaicus* is a constant danger. The careful appreciation of levels and of the rise of the tide, the difference between spring tides and ordinary tides, the meaning of the terms "high neap tide" and "low neap tide," "high spring tide" and "low spring tide," the various types of tide gates and how they are used, were all points that are of the greatest importance to us in dealing with drainage in North Cantonment, Pulau Tekong and in Penang. As in all the schemes of drainage which were shown and explained to us, the most important point was to start at the outlet. The outlet must be as low as possible, and from there on there must be as few open drains as possible, and as few subsoil drains as are necessary, and the level of these tidal drains is not a matter of luck in taking the lowest point in the existing ditch. Tides must be noted over a considerable period in each place, because the rise and fall of the tide differs materially in this country over comparatively short distances, and the rise in the spring tides is so great that every drainage scheme which involves a tidal area must take note of it.

In two of the areas which were shown to us it was made quite clear that a mangrove swamp rendered dangerous by clearing needed comparatively inexpensive treatment to ensure that the area was washed by the tide every day and therefore made quite uninhabitable to *A. sundaicus*, which only breeds in fairly brackish water the salinity of which is slight.

Colonel Covell gave us a most interesting lecture on the control of the breeding of mosquito larvæ by the breeding of larva-eating fishes, and it would seem that one fish, the common name of which is "millions," and whose proper name is "*gambusia*" is the only effective larvicide.

LARVICIDES.

We were then given a lecture on larvicides by Dr. Scharff and a demonstration in the field. It was quite plain from the experiences quoted by Dr. Scharff from all over Malaya that Paris green is of little value in this country for two main reasons :—

(1) Rain is so prevalent that the Paris green is washed down to the bottom of any ponds, streams or marshes, and therefore becomes ineffective in a short time.

(2) The diluting material for Paris green is hard to come by as road dust is very uncommon and the soap-stone which is the best medium for the dilution of Paris green has to be imported from Calcutta. The expense is therefore very considerable.

It has been found that oil is the best larvicide and the two chief petroleum companies, the Asiatic Petroleum Company and the Standard Oil Company of New York, have each produced an excellent anti-malaria oil. The first-mentioned company has published the prescription for its larvicidal oil and the many experiments which have been made to find an oil with the maximum toxicity, maximum spreading power, and minimum evaporation. A most interesting demonstration was given by an official

of the Asiatic Petroleum Company showing the toxic effect of volatile hydrocarbons of all classes on mosquito larvæ, and the spreading powers of oil on water, with the surface tension figures for spreading and non-spreading oils, the power of evaporation of high and low vapour pressure liquids, and of blended oils.

The result of their experiment, namely the oil called "malariol," was shown to us, and its effect on larvæ *in vitro* was seen on the screen and under the microscope. Dr. Scharff then showed us the way in which he considers oil should be spread, preferably by sprayers, and he recommended the "Four Oaks" Spray as one of the most suitable. He showed us the various ways in which oil was wasted and the toxic effect on grass and herbage and plant life of all kinds which any oil has. The effect of the Standard Oil Company's product was seen by us later and the difference in toxicity between the products of the two companies was negligible. The Standard Oil Company do not publish the prescription of their product.

During all the foregoing lectures, demonstrations and experiments, we worked in company with the engineers but, in the second week, the medical delegates were working by themselves and our lectures embraced more work on malaria control with particular reference to its cost, the economics of the problem, and the methods by which it should be made more acceptable to the general public.

Further lectures in epidemiology were given by Colonel Covell in amplification of what he had said during the previous week and, finally, we were given two most interesting lectures by Professor B. A. R. Gater of the College of Medicine. These lectures were on special entomology, and his explanation of the necessity for exactitude in nomenclature was of great value. His description of the more recent work in identifying and classifying anopheles mosquitoes was remarkably useful to one who had not kept in complete touch with the literature of the subject during the last ten years.

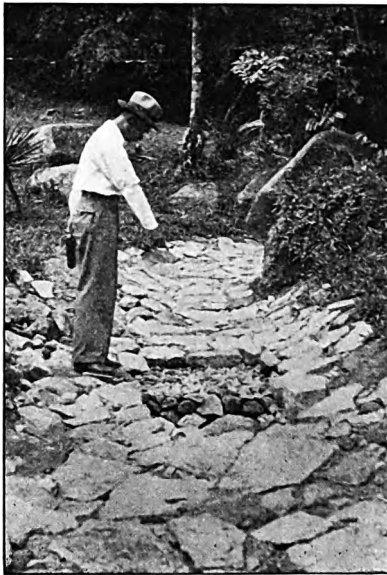
We left Singapore for the remainder of our course which consisted of further demonstrations and lectures by Dr. D. W. G. Faris and his Sanitary Engineer, Mr. Villiers, in Penang, with a solid groundwork on the principles of malaria control and the practical measures dependent on these principles. We were filled with a profound admiration for the energy, enthusiasm and brilliance of our instructors.

PENANG.

The four days that followed in Penang were of particular interest to me as the lectures we were given and the demonstrations to us largely concerned the military area on that island where the local health authorities, namely our two instructors and others, have taken over malaria control on our behalf and have achieved complete mastery. On our first day we were shown a waterfall area, stone packing most successfully done, and a number of flushes, automatic and hand-worked. This use of flushing streams as an anti-malaria measure was first brought to notice in the Sudan, but has been brought to perfection in this hilly island where its use has saved many

thousands of pounds in draining streams and, when carefully worked and equally carefully managed and inspected, it has proved itself completely successful. There are many types of automatic sluices but one type in the simple form of a U-tube flush seems to be the most successful yet devised.

On the second day we were shown the advances which have been made in the control of malaria in rural areas by the people themselves. Natural methods such as fascine drainage, earth bund sluices, stone packing and coconut husk packing of drains, and similar cheap and satisfactory, if not foolproof, methods of larval control were shown us. The most interesting feature was the malaria consciousness of the villagers, their pride in the work



Stone-packing, showing method of laying stones.



Proper outlet to stone-packed drain in Penang.

they had done themselves, and the much increased prosperity which is the result of their freedom from disease and better drained land.

The following day we went to Butterworth and were shown the Butterworth drainage scheme, which deals with a low-lying area in which *A. barbirostris* seems to be the principal carrier of malaria—an unusual experience for Malaya, which in fact is the only place where this anopheles is the chief source of trouble.

Finally, on the last day, we travelled to the Dublin Estate, Kedah, where the estate medical officer, Dr. Wallace, has been carrying out valuable experiments in malaria prophylaxis with atabrin. He has ceased to attempt any malaria control by oiling and uses atabrin, 0.4 gramme per adult per

week, with relative doses for children, as the sole means of combating malaria. I examined 150 children and found not one with an enlarged spleen though the larvæ of *A. maculatus* were to be found in streams all about us. That this was not entirely due to my lack of skill in palpating spleens was borne out by the fact that three other delegates skilled in the art were also unable to find any enlarged spleens amongst the children.

This method and its results are the subject of several articles published by Dr. Wallace in the *Malayan Medical Journal*. It is a method not applicable to our troops except under conditions of mobile warfare in heavily infected areas, and the effect of this dosage of atabrin on fair-skinned people working in the sun requires further investigation.

In this last part of the course the enthusiasm and energy of Dr. Faris of Penang, Dr. Nicholas of Province Wellesley, and Dr. Wallace of Kedah, were equal to that of anyone we met in Singapore and seem to be natural to health workers in Malaya.

This paper is a short if rather confused description of a most excellent course, the value of which should be inestimable to anyone who is attempting to control malaria in any part of the world, and without which no hygiene officer in Malaya can attempt to do anti-malaria work with any degree of success.

It would now perhaps be as well to summarize the lessons learned which are :—

- (i) The importance of drainage, the principles of it and the best methods of lowering the water table of the land in such a way as to exclude breeding places for anopheles mosquitoes.
- (ii) The energy, persistence and attention to detail required from the medical officer in charge of health measures.
- (iii) The bionomics of the more important malaria carrying anopheline mosquitoes in Malaya.
- (iv) The economic factors in malaria control.
- (v) The modern methods of controlling and treating malaria in Malaya.

In addition to the knowledge and experience gained it was delightful to come into contact with so many highly skilled and enthusiastic workers who were willing to put themselves at one's disposal, and the contacts made have proved invaluable since the course and will, I am sure, be no less valuable during the ensuing years.

Seeing that so many of our problems are man made and the result of thoughtless work on the part of engineers and contractors, it seems a pity that only one engineer officer could be allowed to attend the course, a course that would have been of immense interest and importance to any officer employed in constructive works in the tropics.

Finally, I only hope that if these courses are held in future years opportunity will be given to R.A.M.C. officers to benefit by them and to get an insight into the problems involved in the control and treatment of malaria which should be invaluable to the Service.

BACTERIOLOGICAL RESEARCHES ON CASES OF CEREBRO-SPINAL MENINGITIS, CONVALESCENTS AND CARRIERS.

BY MAJOR C. E. VAN ROOYEN,
Royal Army Medical Corps.

AND

CAPTAIN J. CAMERON MORRIS,
Royal Army Medical Corps.

IN this publication we desire to record the results of bacteriological experiments performed in the months of February, March, April and May, 1940, during an outbreak of cerebrospinal meningitis (c.s.m.) which affected the B.E.F. The opportunities provided allowed us to make certain comparisons between the existing conditions and the circumstances and general findings reported during 1915-19 by Mervyn Gordon, Tulloch, Glover and others in their classical observations on c.s.m. (see Special Report Series, Medical Research Council, No. 50).

As far as the epidemiological characteristics of the disease are concerned, it is likely that the predisposing factors which favoured the appearance of c.s.m. in the winter and early spring of 1939-40 were similar to those operating in 1918-19. Thus it is conceivable that the damp weather, the transference of large numbers of British troops to foreign soil, and the mass movement of civilians from vulnerable to safe areas of the country, resulted in a general interchange of nasopharyngeal bacterial flora which precipitated an outbreak of the disease. It is also likely that interference with the ventilation of public and domestic buildings enforced by the rigorous black-out conditions contributed towards the magnitude of the 1939-40 epidemic. Operating collectively, all these factors tended to increase the number of persons harbouring meningococci in the nasopharynx, so that *pari passu* the proportion of susceptible individuals liable to contract infection increased in number. For instance, the researches of Gordon (1919) demonstrated that, at the time of an epidemic among a mixed military population, the carrier rate was 20 per cent—a figure based on a very large number of examinations. Our own observations though limited in number also supported this view, for of 107 unselected contacts whom we examined from a wide area, 30 were positive, i.e. 28 per cent.

In the case of military camps and training establishments the carrier rate is higher (see Tulloch 1917); and Glover (1918) mentions that at a certain depot he found the carrier rate to be as much as 70 per cent during the period April-May-June, 1916. In short, as Gordon (1919-20) has expressed it, "the carrier rate is the pulse of the epidemic," and consequently, an outbreak of the disease is preceded by a rise in the carrier rate.

Whilst this may be so, it is equally true to say that a high carrier rate could exist without an epidemic, since the carrier rate is but a single factor—a feature well illustrated in the work of Dudley and Brennan (1934), who revealed that a carrier rate of 50 per cent could be maintained for over a year without c.s.m. developing. The indications are that whilst a high carrier rate may portend the occurrence of an epidemic under one set of circumstances, it may mean nothing among a community living amid different surroundings.

In theory it would seem that the most effective method of controlling c.s.m. would be to segregate and treat all carriers, but in actual practice this is obviously quite impossible owing to the very large numbers during an epidemic. Moreover, past experience has shown that, notwithstanding the diligence with which carriers are tracked down and measures employed to treat them, such action fails to stem the course of an epidemic. There is also the unpleasant prospect to be faced that a treated carrier is always exposed to reinfection. These views have been epitomized in the recently published Army Memorandum on Cerebrospinal Fever among Troops, February (1940) in the following three paragraphs where it is stated that: "wholesale swabbing of large numbers of persons serves no useful purpose . . .," that "carriers should be given such treatment as the officer in charge of the case and the pathologist may consider necessary . . .," and lastly that "segregation of individual carriers for a longer period than three weeks will seldom be necessary."

The data recorded in this paper were obtained when the old regulations were in force and at the time when wholesale swabbing was still in vogue, and many of our observations tend to reaffirm the finding of our forerunners in this field. Our investigations include a report on the good results following the treatment of c.s.m. carriers with sulphanilamide and c.s.m. cases with M & B 693, according to schema of dosages laid down in the latest Army Memorandum on Cerebrospinal Fever among Troops, dated October 23, 1940.

TECHNIQUE OF ISOLATING MENINGOCOCCUS FROM NASOPHARYNGEAL SECRETION.

Standard procedures were employed throughout. Briefly they were as follows. Having obtained a specimen of nasopharyngeal secretion with a West's post-nasal swab, a warm blood-agar plate was heavily inoculated by the multiple stroke inoculation method and incubated at 37° C. for thirty-six hours. At the end of this interval two or more suspicious colonies were picked off with a loop, subcultured on ordinary serum agar as well as ordinary agar media and incubated at 37° C. for twenty-four hours, at the end of which time films were made from each culture and examined for evidence of diplococci. In the event of growth developing on ordinary media the cultures were automatically discarded but, where growth appeared only on serum agar, further tests were performed by inoculating glucose and

maltose serum agar media. In the case of any typical meningococcal colonies which could not be subcultivated on ordinary agar and which fermented the sugars mentioned, final identification was achieved by testing the organism for agglutination with Group I and II anti-meningococcus sera.

EFFECTS OF M & B 693 TREATMENT.

Clinical.—200 consecutive cases of c.s.m. were treated with M & B 693 by Captain Morris, of which the last 83 were investigated bacteriologically by Major van Rooyen and the earlier 117 by his predecessor Lieutenant-Colonel F. J. Hallinan. The dosage employed varied according to the severity of the patient's symptoms. A very ill man received 8 grammes daily for two days, followed by 6 grammes for three days and then 3 grammes daily for five days, the quantity of drug administered being 49 grammes over a period of ten days. A mild case was given 6 grammes daily for two days, followed by 4 grammes daily for two days and then 2 grammes daily for two days, altogether a total of 24 grammes in six days.

Only three deaths occurred out of 200 patients thus treated, no cases of agranulocytosis, severe hæmaturia or anuria were observed, and all the remaining patients recovered completely. We would like to add, however, that some complained of giddiness and fainting attacks during convalescence, in view of which complaints we would suggest that a minimum period for recuperation should be stipulated following an attack of c.s.m., for example, three months after a mild infection. Furthermore, we believe it would be a wise procedure to submit all recovered c.s.m. cases to specialist neurological examination prior to resumption of military service.

Bacteriological.—No organism could be demonstrated either in films or in culture in fifteen of the eighty-three cases investigated bacteriologically by C. E. van Rooyen. Sixty-eight stained films prepared from centrifuged cerebrospinal fluid (c.s.f.) revealed typical meningococci out of which sixty-two different strains of the organism were successfully cultivated, typed and identified. These findings are in accordance with what is well recognized, namely, that meningococci are not always to be found, and occasionally may not be cultivable, although seen in direct films.

In view of the substitution of M & B 693 for antiserum treatment, we seized the opportunity of investigating day by day, in such cases as this was possible, the physical or other effects of chemotherapy on the cytology of c.s.f. in general and on the morphology of the meningococcus in particular. The results showed that, after the administration of M & B 693, the meningococcus rapidly disappeared from the c.s.f. It is scarcely possible to lay down any definite standards, but we have reason to believe that in the case of a heavy infection, in which a dose of 8 grammes of the drug is given on the first day, meningococci are no longer visible twenty-four hours later and thereafter the polymorphonuclear leucocytic infiltration subsides. The lymphocytes and monocytes are the last to disappear. With regard to the process by which the meningococcus is destroyed, it is obvious from a number

of films prepared from persons under treatment that about twelve hours after the drug has been given the organism begin to show swelling, haziness of outline and loss of diplococcal formation. This change is most marked in the extracellular cocci which are the first to disappear from the c.s.f., followed later by the intracellular ones and, on the second day of treatment, the majority of organisms represent partially disintegrated structures scarcely recognizable as meningococci. These observations suggest that M & B 693 exerts an inhibitory action on the growth of the meningococcus so that the extracellular forms die off and undergo involution as the result of bactericidal action, whilst the intracellular cocci become more vulnerable to phagocytic action. See also Colebrooke *et al.* (1936), McIntosh and Whitby (1939), Fleming (1940) and Oag (1939) for views regarding the mode of action of drugs of the sulphonamide class.

ACUTE MENINGITIS WITHOUT MENINGOCOCCI IN C.S.F.

As mentioned earlier we encountered fifteen patients who showed all the classical signs and symptoms of meningitis without meningococci being visible either in films or culture. Thus no visible micro-organism could be blamed for the patient's illness. There is little doubt, however, that the majority of these persons suffered from c.s.m., but we believe that among the fifteen, we encountered three patients whose clinical history and course of illness were typical enough to justify a diagnosis of benign Lymphocytic Choriomeningitis (l.c.m.) being made. This condition is also known by various other names, such as aseptic meningitis and *Maladie d'Armstrong*, and has been extensively studied in America by Armstrong and Lillie (1934), and in Great Britain by Findlay *et al.* (1936). A case occurred in the B.E.F. and was reported by Findlay, Stuart-Harris and MacCallum (1940). A full account of the disease, its diagnosis, and a comprehensive bibliography of the subject is to be found in the publication of van Rooyen and Rhodes (1940).

Unfortunately, in the three cases observed by us, it was not possible to confirm the diagnosis by isolating virus from the cerebrospinal fluid, or by tests to prove that specific antibodies existed in the patient's blood but, nevertheless, it is correct to say that all cases were clinically and cytologically typical of acute lymphocytic choriomeningitis. The existence of l.c.m. emphasizes the necessity of keeping a sharp watch for its occurrence during epidemics of c.s.m., and, in consequence, special attention should be paid to cases of acute meningitis where micro-organisms are absent from the c.s.f. We would go so far as to propose that in every such instance, as a routine procedure, an effort should be made to recover l.c.m. virus from the c.s.f. and the patient's blood should be examined for evidence of specific antibodies.

OBSERVATIONS ON C.S.M. CARRIERS.

Thirty-six soldiers harbouring meningococci in the nasopharynx were treated by giving them orally 3 grammes of sulphanilamide daily for six

days. On the seventh and eighth day swabs were taken and examined for presence of the meningococcus by the usual methods. Thirty-five out of thirty-six carriers readily responded to such measures and became negative on the eighth day, but the remaining case, despite local treatment by the e.n.t. surgeon, continued to harbour the organism for several weeks and even resisted a second course of sulphanilamide. Two e.n.t. specialist examinations revealed no abnormalities. With obstinate cases such as this, it would be interesting to try the effect of larger doses of the drug, for instance, a total of 24 grammes given over a period of six days.

We believe that the general surroundings amid which these patients were nursed also contributed substantially towards the speed with which carriers became negative. Our cases were housed in well lighted and ventilated rooms of a hospital facing the sea and patients were encouraged to spend as much time as possible in the sunshine as part of their daily routine. Apart from the above, no other forms of treatment were prescribed and such remedies as nasal sprays, inhalations and gargles were not used. Obviously, owing to the small number of carriers thus treated, no definite conclusions can be drawn, but it is interesting to record that under the conditions described above, thirty-five out of thirty-six carriers yielded to treatment within eight days. We would also mention that several of the patients who were referred to us from other units were labelled as chronic carriers, and had failed to respond to treatment with antiseptics applied locally.

OBSERVATIONS ON THE NASOPHARYNGEAL BACTERIAL FLORA OF C.S.M. CONVALESCENTS.

Carriers and Contacts—Before and After Chemotherapy.—With seriously ill patients it was not possible to secure post-nasal swabs without subjecting them to unnecessary discomfort and, consequently, we are unaware of what proportion of our c.s.m. cases also carried the meningococcus in the nasopharynx prior to treatment.

A rough estimate of the carrier rate was, however, obtained from the results of tests on 107 contacts serving in different areas in France, thirty of whom were found to be positive. Thus it is reasonable to infer that 28 per cent, or approximately a quarter of such contacts, were carriers and probably, in the case of actual c.s.m. patients, many more than this number harboured the meningococcus in the nasopharynx.

With reference to the 113 cases after treatment, these were swabbed twice prior to discharge from hospital and only three were found to be positive. It is conceivable that the latter cases may have been either resistant to M & B 693, or else have become reinfected in hospital. The results obtained with carriers following their treatment with sulphanilamide have already been mentioned.

General Conclusions.—Apart from the disappearance of the meningococcus from the nasopharynx of the majority of convalescents and carriers

after treatment, we also noticed that the drug appeared to diminish the incidence of other potentially pathogenic bacteria normally resident in the nasopharynx. For instance, during the winter months in France, although streptococcal sore throats were prevalent, in treated meningococcus cases and carriers it was found that streptococci were rarely cultivated and the bacterial flora in general seemed to be abnormally scanty in certain cases. Further investigations in this direction might provide valuable information regarding the effects of chemotherapy on the nasopharyngeal flora.

RELATIVE INCIDENCE OF SEROLOGICAL GROUPS.

Sixty-two strains of meningococcus were isolated from different cases of c.s.m. and were identified as follows. After a preliminary direct slide agglutination test had been carried out, the result was confirmed by testing the organism for agglutination with six dilutions of standard Group I and II antisera varying from 1 : 30 to 1 : 960, the mixtures being observed in agglutination tubes. The control test consisted of an emulsion of organisms in which saline had been substituted for serum. For antigen an eighteen hours' old suspension of meningococcus in saline was usually employed without preliminary heating, but, in some tests as discovered by Gordon (1917), bacillary emulsion which had been heated to 65° C. for half-an-hour yielded better flocculation effects. All mixtures were incubated at 56° C. for four hours, after which a preliminary reading was made, followed by a second and final reading after the tubes had stood for twenty-four hours at room temperature.

The results demonstrated that, although according to the slide agglutination test 60 out of 62 strains were agglutinable by Group I and not by Group II serum and, presumably, all the strains were clearly divisible into two groups of meningococci, yet parallel quantitative macroscopical tests failed to yield identical results. According to the latter it was repeatedly noticed that the difference between the specific agglutinating properties of Groups I and II antisera was less sharply defined than the slide agglutination test had originally induced us to believe. For instance, sixty of the strains which were isolated were readily agglutinable by Group I serum up to an end-titre of 1 : 240 to 1 : 480, but, in each one of these tests, the same organism showed some degree of cross-agglutination with Group II antiserum in lower dilution, generally varying from 1 : 30 to 1 : 60.

GROUP II STRAINS OF MENINGOCOCCI.

From C.S.M.—Among various strains of meningococci which were recovered from spinal fluid (c.s.f.) strain "Damario" seemed to possess a double antigenic structure and was agglutinable with both Group I and II meningococcus antiserum, in each case up to 1 : 120 dilution of serum. However, after repeated tests it was eventually decided that the organism was more strongly agglutinated and in a higher titre by Group II than by

Group I antiserum and, accordingly, it was classified as belonging to Group II rather than Group I. A similar conclusion was also reached by Major Stuart-Harris, R.A.M.C., who very kindly provided a report on cultures sent to him. Dr. A. J. Rhodes of Edinburgh University likewise confirmed these observations. The subdivision of meningococcus strains into these two standard groups is thus not so sharp as may have been supposed, thereby supporting the earlier conclusions of Fildes and Baker (1918).

From Carriers.—Two other Group II meningococci were isolated from nasopharyngeal secretion and shown to be agglutinable up to a titre of 1 : 240 of serum and, like the others, cross-agglutination was also observed in a dilution of 1 : 30 with Group I antiserum.

The above results suggest the following conclusions: (a) Group I meningococcus was the predominant infecting organism responsible for the February-March-April outbreak in the B.E.F.; (b) certain strains of meningococcus (e.g. Damarico) are of dual antigenic composition, being agglutinable to an approximately equal degree both by Group I and II sera; (c) meningococci classified as Group I contain varying amounts of the antigenic fraction characteristic of Group II; (d) this latter feature, however, is not detected by the slide agglutination technique.

It is of some interest that, of sixty-two cases of c.s.m. studied, sixty proved to be Group I infections; and of thirty strains isolated from the nasopharynx of carriers twenty-six were identified as Group I and four as Group II. On the face of it there seems to be no doubt that Group I meningococcus is the commoner organism, both in c.s.m. and in the carriers, but we have been unable to perform a larger number of examinations to warrant such deductions and our results are, therefore, only suggestive. It may well be that this was actually the case, and that the low incidence of c.s.m. due to Group II meningococcus was attributed to the small number of Group II meningococcus carriers. On the contrary it was equally conceivable that Group II meningococcus was more prevalent among carriers than our observations had led us to suppose and that its low incidence in c.s.m. was explicable on the grounds that the Group II meningococcus was less invasive and pathogenic than Group I meningococcus. This conclusion was reached by Griffith who also found that the majority of strains isolated from the pharynx were of Group II (*see* Muir and Ritchie 1937). Extensive investigation on c.s.m. carriers is still required before these outstanding problems can be solved.

Result of Blood Cultures.—Several unsuccessful attempts were made to recover the meningococcus from the blood in acute cases of c.s.m. prior to the administration of M & B 693. 10 c.c. of venous blood was obtained with strict aseptic precautions and inoculated into glucose broth medium, warmed to 37° C. prior to use and incubated at 37° C. for two days. Although the medium employed was capable of yielding luxuriant growths of meningococcus, our results proved negative throughout. Positive results were, however, obtained by Major H. C. Magnus and Major H. J.

Fidler of Nos. 2 and 3 General Hospital, B.E.F., from a case of chronic meningococcal septicæmia, an interesting condition which was studied originally by Soloman (1902) and lately by Dimson (1938). The strain of meningococcus supplied to me through the courtesy of Majors Magnus and Fidler proved to be a typical Group I organism. Colonel Hepple has informed me in a personal communication that Major Stuart-Harris also successfully isolated the organism from a case during the first week of the illness.

MENINGOCOCCAL TONSILLITIS WITH PHARYNGITIS.

We wish to report the occurrence of six cases of acute tonsillitis accompanied by pharyngitis due to meningococcus infection. The patients comprised a medical specialist, a surgical specialist, a chaplain and a private soldier, who had been repeatedly exposed to infection during the course of their duties, together with two other ranks from whom no definite history of contact with patients could be elicited. Clinically, the signs and symptoms complained of by these individuals were very similar; the onset was sudden, the throat was painful, the tonsils were acutely inflamed, general malaise was present and in two cases a transient pyrexia reached 100° F. and lasted for two days. In general, the appearance of the throat and fauces was not unlike that observed in early acute streptococcal tonsillitis. All six cases readily responded to treatment with M & B 693, and were discharged to duty in ten days.

Bacteriological Findings.—From four patients a profuse growth of typical Group I meningococcus was isolated and in the remaining two a mixed growth of meningococcus and *Streptococcus viridans* was obtained. Scattered colonies of *Staphylococcus albus* and *aureus* were also present but no significance was attached to their occurrence. Apart from the bacterial flora mentioned, other common pathogenic organisms usually found in this site could not be demonstrated, and thus a search for hæmolytic streptococci, *B. diphtheriæ*, Vincent's organisms, and *Monilia albicans* proved to be negative. Also in the last two cases a possible herpes virus infection was excluded by scarifying the cornea of a guinea pig and examining this histologically for evidence of inclusions. From the above investigation it was concluded that four of the cases we studied were acute tonsillitis caused by the meningococcus alone, and the remainder were due to the meningococcus associated with *Str. viridans*.

AGGLUTINATION TESTS WITH CONVALESCENT PATIENTS' SERUM.

In the past, since the majority of c.s.m. cases received antimeningococcal serum on admission to hospital, investigations into the occurrence of specific agglutinins in patients' blood were not of much significance. However, with the advent of chemotherapy, it is now possible to investigate this aspect of the disease, and consequently we tested the blood of twenty-six convalescent cases of c.s.m., varying from the seventh to the forty-ninth day after the

onset of illness, for evidence of agglutinins. The technique of the test was identical with that described earlier for grouping of the meningococcus and, on this occasion, dilutions of patients' serum ranging from 1 : 30 to 1 : 960 were used and, in addition to the saline antigen control, an extra antigen check was incorporated which consisted of normal human serum plus antigen.

Results Obtained with Normal Serum (taken from healthy soldiers during the months of March, April and June).—Eighty-four control sera (which were negative to the Kahn reaction) were examined. In no instance were agglutinins for the meningococcus found to be present in a serum dilution of 1 : 30. In a limited number of experiments a series of lower serum dilutions varying from 1 : 4 to 1 : 64 was set up, and here likewise the results were negative throughout. These results suggest that natural agglutinins for the meningococcus are absent from normal human serum even in low dilution.

Results with Sera of C.S.M. Cases and Convalescents.—The earliest sign of an agglutination reaction was observed in one case on the seventh day after the onset of patient's illness and the patient's own Group I meningococcus, as well as another strain isolated from a different patient, were agglutinated by the serum to an end-titre of 1 : 30. No cross-agglutinin for Group II meningococcus could be found and, in a few cases, by means of agglutinin-absorption tests, it was possible to demonstrate that all Group I agglutinins could be completely removed from a patient's serum by first treating it with either the homologous infecting strain or with another Group I meningococcus. The *latest time* after c.s.m. at which agglutinins could be demonstrated in patients' blood was the forty-ninth day when a 1 : 30 dilution gave a positive result. Tests with sera obtained after this time were invariably negative. The period at which the *highest agglutination response* was recorded was approximately about the twenty-first day after the onset of the disease, at which stage of convalescence the serum frequently reacted in a dilution varying from 1 : 120 to 1 : 240. From the twenty-first to the forty-ninth day considerable variation in results was noticed and, in general, it seemed that the increase of agglutinins was a transient phenomenon which quickly appeared and disappeared. In some cases no agglutinins could be demonstrated at any stage throughout the illness, even though the patient's own strain of organism was used as antigen, and for this we could offer no explanation except to suggest that the rapidity with which M & B 693 acted allowed no time for their development.

DISCUSSION.

Owing to circumstances, our researches were terminated before we were able to perform as many tests as we would have liked to have done. The results, nevertheless, indicate that, after a case of c.s.m. has been cured with large doses of M & B 693, it is uncommon to find such individuals harbouring meningococci in the nasopharynx.

Regarding carriers, our experience with a few, thirty contacts, suggests that a short course of M & B 693 consisting of 3 grammes daily for six days, is enough to make the majority negative, and we would recommend that carriers who prove resistant should be given a full course consisting of 5 grammes daily for two days, 4 grammes daily for two days, and 2 grammes daily for two days, the total quantity administered being 24 grammes over six days.

The cases of meningococcal tonsillitis and pharyngitis reported are of particular interest as they illustrate the necessity for examining all throat swabs, especially during the time of a c.s.m. outbreak, not only for the common pathogenic organisms such as streptococci and *B. diphtheriæ* but also for the meningococcus. This organism should be regarded as a definite cause of sore throats, and we deprecate the tendency to call all gram-negative nasopharyngeal diplococci "*M. catarrhalis*" so often without cultural and serological confirmation. We would advocate that, in future epidemics, watch should be kept for meningococcal tonsillitis and these cases be treated promptly. There is much to support the view of some bacteriologists, e.g. Professor Mackie (personal communication), that the condition of c.s.m. is primarily one of epidemic rhino-pharyngitis and secondarily one of meningitis.

The work of Kennedy (1926), followed by the more recent observations of Stott and Copeman (1940) on chronic meningococcal septicæmia, has drawn attention to yet another aspect of meningococcal infection and it was in this connection that a search for specific agglutinins in cerebrospinal meningitis cases was undertaken. It was not always possible to diagnose chronic meningococcal septicæmia, popularly referred to among members of the B.E.F. as Stott's disease, with certainty, for it was seldom that a positive blood culture could be obtained and often nasopharyngeal throat swabs remained negative throughout the patient's illness. Thus the recognition of the disease usually depended on clinical evidence alone, coupled with the dramatic effect of M & B 693 treatment, the patient becoming afebrile within twenty-four hours. In all suspected cases of Stott's disease agglutination tests should be done employing Group I and II suspensions of meningococcus, as antigen, and from our experiences in cases of c.s.m. we would be inclined to interpret as positive agglutination produced by patient's serum diluted 1 : 30 or upwards.

According to the researches of Bell (1920), specific complement-fixing antibodies to the meningococcus are also developed in the sera of c.s.m. cases after the fourth day of illness, and these tests should also be utilized. The greatest obstacle to the application of serological reactions in the diagnosis of meningococcal infections is the fact that although at present two antigenic groups of the organism are recognized and designated Group I and II respectively, much still remains to be learnt regarding the precise antigenic composition of the meningococcus. In view of the work of Stott and Copeman (1940) on chronic meningococcal septicæmia this aspect

of the problem acquires a fresh significance and, in cases of meningococcal septicæmia, the patients' serum should be tested for agglutinins, not only against Group I and II meningococcus but also against standard suspensions of Gordon's (1920 a) four types of meningococcus.

In conclusion, we would make the statement that in its clinical, bacteriological and epidemiological aspects the meningococcus is an organism the pathogenesis of which is still imperfectly understood and, although our observations are incomplete, we hope that some of the issues we have raised will merit consideration in future epidemics.

CONCLUSIONS.

(1) Out of 200 cases of cerebrospinal meningitis treated with M & B 693, only three died (mortality 1.5 per cent). In eighty-three consecutive cases the use of M & B 693 not only cured the disease but also abolished the carrier state during convalescence. The average age of our patients was between 20 and 30 years old.

(2) Encouraging results were obtained in a small series of thirty-six carriers, thirty-five of whom became negative following treatment with 18 grammes of sulphanilamide administered over a period of six days.

(3) Six cases of acute meningococcal tonsillitis are reported, and the importance of this condition is emphasized in relation to the carrier problem.

(4) Observations on the occurrence of specific anti-meningococcal agglutinins in patients' sera have confirmed the earlier researches of Gates (1918) and Bell (1920). Such agglutination reactions are often feeble in character and liable to escape attention unless care is exercised whilst performing tests.

(5) The advent of chemotherapy has enabled us to reinvestigate the subjects of serum agglutinins free from the artificial effects caused by the introduction of therapeutic anti-serum. It has been shown that antibodies which are present from the seventh day of illness attain their maximum on the twenty-first day and thereafter swiftly decline.

(6) The possible value of agglutination tests as an aid to the diagnosis of chronic meningococcal septicæmia is discussed.

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MUSINGS ON MEDICAL EVACUATION IN MOBILE WARFARE.

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THE function of the R.A.M.C. in war, as regards dealing with actual casualties, lies in their rapid evacuation to the rear where they can be efficiently dealt with medically and where they do not affect the morale and mobility of the fighting forces.

The present teaching on the subject can be found in such official publications as Field Service Regulations and R.A.M.C. Training. These problems, along with the forecasting of the number of casualties, loads of medical equipment, etc., are very ably dealt with by Lieutenant-Colonel Nicholls in his *Strategy and Tactics of the Army Medical Service in War*.

This account, however, is based on the experience of the late war which was predominantly one of stasis and was satisfactory for the rate of movement as then known. But even then at times the question of supply and evacuation became urgent owing partly to shifting railheads.

The existing policy as regards medical tactics is to retain the mobility of the Field Ambulance. This is attained by the rapid evacuation of casualties and by not unpacking more equipment than is necessary.

The problem is relatively easy as regards Field Ambulances but is rather different as regards the advanced sections of the Casualty Clearing Station which, at best, are rather cumbersome and are dependent on outside transport for a move. It worked out satisfactorily in the late war with the degree of mobility then known.

The creation of the hypermobile division of mechanized units introduces its own problems as regards evacuation. The crux of the question lies in the rate of movement, perhaps carried out over some time, of fifty to ninety miles a day under favourable conditions. There are two parts of this problem which require consideration, that of regimental collection and that of evacuation. The method adopted in the late war of clearing the battlefield does not seem altogether applicable to a mobile division without modification.

The existing policy is, I believe, that each vehicle carries its own casualties which, in due course, are brought back to unit headquarters. Here they are dealt with by the R.M.O. In the meanwhile, if the vehicle has to be fought, the presence of the casualties may interfere with its manoeuvres and fighting, and delay may be disastrous to the casualty.

F.S.R., Vol. 1, lays it down that under certain circumstances the wounded are left in batches at various centres for collection by Field Ambulances. This necessitates an understanding as to where these centres are likely to be beforehand, or communication between unit and Ambulance during the action.

This sounds very well in theory but would it work out satisfactorily from the casualty's point of view ?

Hence the question arises as to the desirability of some motorized method of collecting the wounded under regimental arrangements. The R.M.O. would be responsible for their collection into suitable centres whence they should be evacuated by the Field Ambulance.

The alternative is collection by a mobile section of the Field Ambulance, organized somewhat on the Cavalry type ; but this of course, tends to exclude the R.M.O. who should be in touch with events locally.

The problem of evacuation from the R.A.P. is also worthy of consideration. There are two aspects of this problem, i.e. where the movement is parallel to a relatively fixed line when the existing organization naturally functions and, alternatively, where the mobile column is penetrating the enemy lines or is outflanking them at a speed higher than that of infantry. In the latter case it is immaterial whether the movement occurs as a break through or in mobile warfare, the problem at issue being the distance from the Field Ambulance to the Casualty Clearing Station.

F.S.R., Vol. 1, lays it down that a chain of Casualty Clearing Stations will be formed where the line of evacuation is unduly long. But how far will this work where there is, say, a daily advance of fifty miles ?

The Casualty Clearing Stations have Mobile Sections which are mobile only in relation to the parent unit. The solution of the problem would seem to lie in one of two directions.

(1) An increase in the number and mobility of the mobile sections. This would involve a reduction of its equipment and the provision of sufficient transport of its own would seem essential, or

(2) The detailing of a Field Ambulance to act as a Casualty Clearing Station on the lengthening line between the existing Casualty Clearing Station and the Regimental Aid Post. Retained cases could then be handed over to the Mobile Section as and when it arrived.

Among the arguments which can be raised against the latter scheme is the immobilization of a mobile unit not equipped to carry out this work.

It has, however, something to be said for it by the reducing of the length of evacuation by car to the advantage of the casualty and to the easement of the work of the M.A.C.s. These duties could be carried out by the Corps Field Ambulance and thus release divisional units to clear the line.

Where the whole territory behind the advancing line is in the active possession of the force, the problem of the lines of communication is relatively simple. When, however, a mobile column penetrates hostile territory, the question of evacuation becomes an involved one according to the distance to be covered and the organized hostility of the inhabitants.

This latter aspect might involve the provision of armed pickets for medical units, to provide for their self-defence, and is obviously allowed for by the Geneva Conventions.

APPENDICITIS IN INDIA.

BY CAPTAIN F. V. STONHAM,
Indian Medical Service.

DESPITE the common claim that appendicitis is rare or even non-existent in India, it nevertheless remains one of the commonest and most important abdominal emergencies that call for surgical treatment. Interest in the subject followed a paper by A. M. Spencer [9] in which he claimed that the disease is unknown in the villages in India and China but is seen in the towns both in the whites and the natives on European diet. This provoked a communication from R. D. MacRae (7) who stated that he had operated upon 28 cases from villages and small towns. The reason that the disease is unknown in Indian villages is simply due to the fact that diagnostic facilities do not exist in the smaller villages and cases are not recognized. It would be equally incorrect to postulate that malaria is unknown in Indian villages, since neither the illiterate native nor the unqualified indigenous practitioner is able to distinguish malaria from other febrile diseases and they simply call them "fever." Almost any civil surgeon can quote distressing cases where a victim is brought in from a distant village dying of peritonitis almost certainly due to appendicitis, the other great cause of peritonitis—perforated septic ulcer—being rare in northern India though common enough in the south. These cases are often removed from the hospital when treatment fails to produce any rapid improvement, and they are taken home to die. In any case, permission for post-mortem examination is seldom given unless the case has some medicolegal features.

Inquiries made while visiting outlying dispensaries reveal that, while appendicitis is not common, it is far from rare. Most of the doctors in charge of these institutions stated that, while they are occasionally able to persuade a patient to go to the nearest surgical centre for operation, the majority not only refuse operation but refuse to leave. The treatment usually given is an approximation to the well-known Ochsner-Sherren régime, with the exception that morphia is nearly always administered. A fair proportion are said to recover but their subsequent fate can seldom be traced. The common belief that Indians who adopt European diet become prone to appendicitis is opposed to common experience. Indians likely to take European diet would be the more educated classes who would at once seek surgical advice if they developed the disease. The writer was Medical Officer to the Indian Military College and the Indian Military Academy for nearly four years. In these institutions the cadets are given a purely European diet on the same lines as in an ordinary officers' mess. During this period there was only one case of appendicitis in the former institution and none in the latter. A no less eminent authority than Boyd [3] supports

the view that appendicitis becomes common when Asiatics take to European food. The Punjab has a population of some twenty-six millions. In 1938, 3,037 operations upon the appendix were performed in Government controlled hospitals with 24 deaths [2]. Apart from a few mission and private hospitals, all the surgery of the province is done in government institutions. It is emphasized that vegetarianism is probably much less in vogue in the Punjab than in other provinces and that more Punjabis than any other class serve in the Indian Army. From these figures it would appear that the incidence of appendicitis among the civil population is only one-fourteenth of that of the Indian Army. The obvious explanation is that the bulk of the cases of appendicitis do not report to hospital, unless we take the rather improbable view that the more generous and better balanced ration given to Indian troops is responsible for the disease. In the Army, soldiers are under strict medical control and all cases of illness receive prompt attention. Official statistics [1] show that the proportion of admissions to the hospital per 1,000, during 1938, for appendicitis was 7.6 in the case of British soldiers, and 1.8 in the case of Indian soldiers. In other words, the incidence among Indian soldiers is about a quarter of that among British soldiers. The higher incidence among officers is noteworthy. The corresponding figures were 11.3 per 1,000 in officers of the British Army, and in the case of the Indian Army, in which the officers are mainly European, the figure was also 11.3.

The ætiology of appendicitis is still an unsolved mystery and all suggestions regarding the probable factors which determine the onset of this disease must necessarily be highly speculative. However, there is no doubt that the condition is very much less common among Indians if not all oriental races. Not only is the incidence among Indians less but they often withstand the effects of the disease to a remarkable extent. Many of them refuse operation and very few of them seem to die if kept in hospital and not permitted to take purgatives and opium, as they would if not admitted. Those cases who are treated by the Ochsner-Sherren method usually subside rapidly. I have seen two acute cases who had refused operation develop abscesses. In one case the abscess burst into the bowel and a large quantity of pus was passed *per rectum* and in the other case it burst externally. Both recovered. It seems beyond doubt that the Indian has a far greater natural immunity to sepsis than the European. Most surgeons who have worked among the native population will, I think, support this view. Even the most ghastly injuries, in which one would not hesitate to advise amputation, often do well with conservative treatment when amputation is refused. The greater immunity seems to be due to the fact that the poorer classes are in constant contact with dirt and infection. Their dwellings are small and ill-ventilated and the floors are made of a mixture of mud and cowdung. Cowdung is dried and kept about and in the house for fuel. Many have not sufficient water to drink and none for washing, while soap is beyond their reach. Clothing is seldom changed or washed. Wounds are seldom

promptly treated with antiseptics. There is little doubt that appendicitis is not only commonest in those countries where the standard of living is high but is actually on the increase. It is possible that these people are gradually losing their immunity to certain types of infection, and this may be one of the factors concerned. Cleaner houses, better ventilation, cleaner food, vacuum cleaners, hot-water services, and the immediate antiseptic treatment of wounds may not be without influence.

The usual Indian diet consists of two large bulky meals per day, taken in the morning and in the evening, and fasting for both economic and religious reasons is common. The food consists largely of carbohydrates but many classes eat meat. The diet is usually deficient in vitamins and in some districts it is grossly deficient. In the hot dry mountainous tracts along the Punjab-Baluchistan frontier there are certain villages where goats and sheep are cheap and meat is consumed in large quantities, while fruit and vegetables are unobtainable during the greater part of the year. I could find no evidence that appendicitis was common in these parts. On the other hand, I have removed gangrenous appendices from strict vegetarians and, in fact, quite recently I removed a gangrenous appendix from an Indian clerk who said he had formerly been a meat eater but had given it up and become a vegetarian. Indians are singularly intolerant of constipation and, if they miss a bowel action one day, they will at once complain of abdominal pain and giddiness and take a purgative. The normal stool of an Indian is usually bulky and quite loose. It seems very doubtful if diet, meaning the *type* of food eaten, has much influence on the production of appendicitis, but it is possible that large infrequent meals and attention to the bowels allows better function of the colon and prevents stasis in the cæcum and in the appendix.

Anatomical peculiarities may have some influence not only on the incidence but on the course of the disease. The cæcum in an Indian is usually higher than that of the European and the appendix is very commonly retrocæcal. The writer has examined 89 healthy bodies and classified the appendices according to the following anatomical features:—

(a) Those in which the appendix is anterior to the cæcum, possesses a mesentery, and is completely invested by peritoneum and freely movable within the adominal cavity.

(b) Those in which the appendix lies behind the cæcum, but possesses a mesentery and is completely covered by peritoneum.

(c) Those in which the appendix lies behind the cæcum and is partly or completely adherent to the cæcum wall, lies under the peritoneal covering of the latter structure, and requires dissection to free the base.

(d) Those in which the appendix lies entirely dorsal to the peritoneum.

The following results were obtained:—

(a)	(b)	(c)	(d)	Total.
20	30	20	19	89

It may be observed that the proportion of retrocaecal appendices is a high one. This would favour early localization of inflammation and reduce the chances of irritating the small bowel. No true faecoliths were found and in all cases the lumen allowed a probe the size of a matchstick to be passed into the caecum with ease and, in fact, in many cases the base of the appendix was funnel shaped. In one case which occurred in a female child, aged 6 years, the appendix was six inches long and passed up the right paracolic gutter, between the wall of the caecum and its serous covering, to the hepatic flexure where the tip only was completely invested with peritoneum and free. The base consisted of a trumpet-like expansion two inches long by one and a half inches in diameter where it joined the terminal part of the caecum. This infantile type is an exaggeration of what is commonly found. The anatomical features are consistent with the observation that Indians who develop appendicitis do not as a rule have the symptoms suggestive of the obstructive type. Pain is the predominant symptom. While concretions do not appear to be common in normal appendices, they are not uncommonly found in those which are removed at operation. Various worms are occasionally found both in normal and in diseased appendices. Their relation to appendical inflammation is obscure. Infestation of the bowel with worms is so common in tropical countries that it may be regarded as almost universal.

DIAGNOSIS.

While atypical cases are not uncommon, the features of an attack of appendicitis in an Indian usually differ but little from those of a typical attack occurring in a person of any other race. The initial pain is often epigastric rather than umbilical and this shifts to the right iliac fossa in a few hours. Vomiting is not usually a prominent symptom. Temperature, pulse and leucocyte count are often not very significantly raised until after the first twenty-four hours. The patient sometimes admits previous attacks but, from illiterate individuals, it is often impossible to obtain an accurate history. Reliance is to be placed on the severity of the pain and tenderness and rigidity in the right iliac fossa. The psoas and the obturator tests are very useful confirmatory tests if positive. Rectal examination may elicit tenderness in the appendix area, but most patients hate the test and insist that they experience great pain as soon as the finger is inserted and it is therefore not a very reliable diagnostic measure.

In the differential diagnosis the following diseases must be considered in addition to other causes of acute abdomen :—

Dysentery.

Dysentery is common in all tropical countries. Pain in the right iliac fossa may sometimes be a prominent symptom, especially in protozoal cases. The absence of true rigidity and definitely localized tenderness, together with the profuse diarrhoea, generally allows diagnosis to be made

without difficulty, besides which the leucocyte count is not significantly raised. Still, difficult cases do occur and, paradoxically, cases of dysentery are met with in which constipation is an initial symptom. The writer has himself experienced such an attack. The disease commenced with abdominal pain and fever which lasted for sixty hours, after which a large quantity of blood, mucus, and pus was passed with immediate abatement of symptoms.

A more dangerous risk, however, is to regard a case of appendicitis as one of dysentery. Dysentery and other diseases of which diarrhoea is a feature are so extremely common in tropical countries that they may co-exist with appendicular inflammation. No reliance can be placed on the presence of diarrhoea as evidence against appendicitis, nor does the passage of blood and mucus necessarily indicate the presence of pelvic abscess.

The following case is illustrative :

G. E. C. N., British officer, aged 23, admitted to the hospital on March 19, 1936, complained of pain in the right iliac fossa of six hours' duration, preceded by umbilical pain. The abdomen was rigid and there was pain in the right lower quadrant, not definitely localized. He had an oblique hypertrophic scar in the right lower abdomen and stated that his appendix had been removed. He was passing frequent thin stools. The leucocyte count was 13,000. Medical consultants at first opposed operation but exploration was carried out and a very thick gangrenous appendix about three inches in length, containing a large fæcolith and adherent to the walls of the pelvis, was removed. The wound was closed and drained and the pelvis was drained through a suprapubic stab. The patient recovered after about three months in hospital. It was subsequently learned from the patient's father, a doctor, that at the previous operation an abscess was drained, and what was thought to be a slough of the appendix was recovered from the pus and further operation was thereafter regarded as superfluous.

Abdominal Malaria.

In the "abdominal" form of malaria, which is not very common but is said to occur frequently in certain districts, great abdominal distress is complained of and the abdomen is tender and retracted. Vomiting is usually a conspicuous symptom and there is often copious diarrhoea. Blood is sometimes vomited in large amounts or passed *per rectum*. The temperature is at first normal or low but rises later in the attack. These cases have been confused with appendicitis but a blood examination may prevent a fatality from an unnecessary operation.

Tuberculosis of the Cæcum.

Tuberculous disease of the cæcum is very common in India. It is more likely to be confused with chronic or subacute appendicitis on account of the pain in the right iliac fossa together with a palpable mass. The

chronic nature of the disease and X-ray examination may lead to its recognition but sometimes the diagnosis is only made after the abdomen is opened.

Regional Ileitis.

Crohn's disease is often diagnosed as appendicitis. The writer has only encountered two undoubted cases of this condition in India, and the diagnosis was made after the abdomen was opened to deal with what was thought to be tuberculosis of the cæcum. The characteristic hosepipe condition of the ileum made the diagnosis at once obvious.

Poisoning.

Poisoning is unfortunately extremely common in oriental countries as a means of suicide or murder. Opium, arsenic and datura are commonly employed. In cases of abdominal emergency the possibility of arsenic and other irritant poisoning should not be lost sight of. The extreme collapse usually enables ready recognition. Painful cramps in the legs occur in both arsenical poisoning and cholera but not in appendicitis.

Ectopic Kidney.

I have seen two cases of kidney situated in the right iliac fossa in Indians post mortem and one at operation. The condition seems to be fairly common. The latter case was sent to me for operation as a case of torsion of an ovarian cyst. A tumour could be felt in the right iliac fossa but, as the patient was a *purdah* woman, I was not permitted to examine her vaginally. The abdomen was opened and a small endometrioma was removed from the right ovary. The appendix was a long coiled partially retroperitoneal one lying over a firm tumour. The appendix was removed and found to be innocent, and exploration proved the "tumour" to be a normal right kidney in an unusual position. In the anatomical museum of the Grant Medical College, Bombay, there is a specimen of a large discoid mass, overlying the sacrum, which consists of the fused right and left kidneys. It is quite possible that, in cases of abdominal pain in individuals in which the kidneys have failed to ascend, a wrong diagnosis of appendicitis or appendicular abscess might be made. Pyelography would remove any doubt.

TREATMENT.

Treatment of appendicitis among the native population presents peculiar difficulties. Apart from cases occurring in the Army, the patients are seldom seen in the early stages of the disease unless the pain is very severe. Almost invariably purgatives, opium, and various sedatives have been administered before the victim is seen by a qualified doctor, and in such cases non-operative treatment is unlikely to succeed. Another argument against Ochsner-Sherren treatment is the fact that patients seldom return to have the appendix subsequently removed. However, if the case is a late one, and provided

the diagnosis is certain and no purgatives are taken, the results of delayed treatment are usually very good. In all other cases operation is the treatment of choice but will often be refused. The muscle splitting incision is the best approach. If the skin is divided transversely instead of obliquely the scar is usually inconspicuous, and it does not become adherent to the suture line in the external oblique aponeurosis. The incision should not be too low, unless there is reason to believe that the appendix lies in the pelvis, since the frequency of highly placed cæcum and retrocæcal appendix have been already mentioned. Neither should the incision be placed too medially because it is sometimes necessary partially to mobilize the cæcum to free a retrocæcal appendix. It is advisable to keep the incision small and enlarge it if and where required. A two-inch incision in the skin and muscles often suffices but extra room can be obtained by dividing the attachments of the internal oblique and the transversalis to the rectus sheath or by cutting across the rectus sheath itself. The aponeurosis of the external oblique is split well laterally and it can usually be retracted, but a small cut across the fibres which can be closed with mattress sutures is on rare occasions called for. Retrocæcal appendices, if adherent, and retroperitoneal appendices are most easily removed by freeing and dividing the base first and burying the stump. The appendix can then be stripped out without much difficulty. Instances in which neither the appendix nor the cæcum can be delivered out of the wound with ease are quite common. The ultra small incision which appears to have become popular has little to recommend it. In any case the aim, a cosmetic one, is seldom realized because the scar subsequently hypertrophies, presumably on account of trauma resulting from the enthusiastic use of retractors.

Spinal anaesthesia is a very real advance. The complete relaxation of the abdominal musculature permits incisions being kept within reasonable limits, and by constricting the bowels makes both access and closure of the wound easy. Apart from military hospitals and the larger civil institutions, the services of a skilled anaesthetist are rarely available in India. The common statement that the McBurney's incision is very prone to be followed by an inguinal hernia consequent upon the damage to nerves does not seem to be in accordance with facts. I have now had an opportunity of examining more than two hundred consecutive cases in which the appendix had been previously removed by this route. The persons examined consisted of officers and other military personnel who require to be examined annually for fitness, recruits, proponents for life assurance, and ordinary patients. I found no case of inguinal hernia. One youth, whose appendix I removed myself, developed a bulge in the inguinal region which gave an impulse on coughing but it was not a true hernia. The case history is as follows :—

S. S. K., Indian cadet, Sikh, age 16, was admitted to hospital on December, 19, 1936, and gave a history of acute pain which commenced six hours previously around the umbilicus and which was followed by retching and shifting of the pain to the right iliac fossa where it remained and increased

in intensity. The appendix was approached through a muscle splitting incision and found to be acutely inflamed and retrocæcal in position, and the cæcum high. Neither the appendix nor the cæcum could be delivered. The wound had to be enlarged and strongly retracted upwards to enable removal of the offending organ. The wound was closed without drainage, and the patient was discharged a fortnight later. Some days after his discharge he began to complain of pain in the vicinity of the wound, which increased and became persistent and troublesome. He was given a lotion to massage the part, reassured and sent home for vacation. On return, he had a distinct bulge in the right inguinal region which became larger on coughing. A truss was fitted and he was advised to take exercise. Three months later there was no sign of the alleged hernia, the truss was discarded, he remained well and was able to play games and take strenuous exercise.

K. Fletcher-Barrett [6], apparently working amongst soldiers, classifies cases of pain in the right iliac fossa into four categories after first instituting Ochsner-Sherren treatment.

(a) Those whose signs and symptoms rapidly subside so that they are quite fit in forty-eight hours.

(b) Those who gradually get better, taking four to five days in the process.

(c) Those who remain stationary.

(d) Those—the minority—who become worse.

Classes falling in category (a) are discharged to duty with instructions to report at once should similar pain recur. In category (b) appendicectomy is advised but not pressed if the patient demurs. In category (c) appendicectomy is advised ten to fourteen days after the onset of the initial symptoms. The cases in category (d) are operated upon forthwith. Fletcher-Barrett emphasizes that the cases are ones of "pain in the right iliac fossa" and not necessarily appendicitis, but nevertheless his remarks obviously refer to cases of appendicitis or suspected appendicitis. His views were strongly criticized by C. M. Finny [5] who considered that the line of treatment he advocated was not only wasteful in time but dangerous, and that the patient should not be deprived the benefits of early operation. It is true enough that all cases of pain in the right iliac fossa are not necessarily due to any disease of the appendix and that operation is not always required. However, in cases where a diagnosis of acute appendicitis can be made with reasonable confidence, it does seem not only unreasonable but contrary to the weight of the current surgical opinion not to operate at once. Ochsner-Sherren treatment has definite indications. Hamilton Bailey [4], who has been one of the strongest protagonists of this form of treatment, very definitely holds that the cases suitable are those of over fifty hours duration, especially where there is a localized mass present. Even then the following exceptions are made :—(1) In the presence of hyperæsthesia ; (2) when there is obvious peritonitis ; (3) in children, especially under 8 years ; (4) when a

purgative has been recently ingested ; (5) when there is any uncertainty of diagnosis.

To sum up, early operation is still the method of choice in dealing with appendicular inflammations in India. The lay public requires education regarding the danger of the disease and the need for early surgical advice. Conservative methods should be reserved for cases where it is definitely indicated and in hospitals which have adequate staff to carry it out properly. It also has to be resorted to in instances where operation is refused. In the British Army in India where prompt diagnosis and operation are possible the mortality of appendical operations is less than one per cent [1].

SUMMARY.

(1) The incidence of appendicitis in India has been discussed and the possible ætiological factors speculated upon.

(2) The more important problems in the diagnosis of appendicitis in the tropics have been put forward.

(3) The treatment has been discussed with particular reference to conservative methods.

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SOME HYGIENIC PROBLEMS WHICH WILL FOLLOW ON THE ADOPTION OF MECHANIZATION IN INDIA.

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MECHANIZATION, which is now rapidly proceeding in India, will inevitably bring in its train certain medical problems chiefly of a hygienic nature. These are given very briefly in the following notes, with suggestions for solution.

The subject, which is a large one, may be considered under two heads : (A) Problems the immediate result of mechanization, and (B) Problems the more remote result of mechanization.

(A) This heading includes :—

(1) *Prevention of Diseases likely to accrue in Mechanical Workshops, Garages, etc.*—This problem is being adequately dealt with in the construction of the new garages, workshops, etc. These have been and are being built, large, spacious, airy and well ventilated, with exhaust fans and protection of the men working in them, in the hot weather, against the effects of heat. Consequently, it is not considered that much trouble will be experienced from inhalation of injurious exhaust gases or effects of heat owing to the precautionary measures already taken in this construction.

(2) *Vehicle Washing.*—Washing of the very large number of vehicles will produce a large volume of water waste to be disposed of. Whether soakage pits will suffice to dispose of this volume remains to be seen. Otherwise disposal will have to be by drainage or gardens ; this will require careful supervision to prevent collections of water becoming breeding places for mosquitoes.

(3) *Diseases Due to Movement of Mechanized Forces.*—This aspect of the subject presents difficulties which at the moment seem almost insurmountable. To begin with, it must be considered that the roads in India, in their present condition, are entirely unsuitable for the rapid movement of mechanized forces. The reason is that the roads in India are not like those at home or in Europe. Only sections of the main roads, such as the Grand Trunk Road or the Great North Road, are tarmaced. Consequently the vast majority of roads in India can only be described as filthy with dust. Those who are experienced motorists in India will, it is thought, back up this statement. Furthermore, outside the large cities and towns, there is no traffic organization on the roads in India. Where tarmac does exist it is only a narrow strip in the centre of the road, insufficient for two vehicles to pass. This strip, or, where it does not exist, the centre of the road, is invariably occupied by slow-moving bullock carts, camel carts, buffalo carts and herds of cattle, etc. To these occupants of the highway

there is no such thing as a "rule of the road" whatever. Whether coming or going, there is a complete absence of "correct side" of the road. They are all over it, left, centre and right. They will not move out of the way. No lights are carried at night. Consequently the mass of dust, thicker than the blackest fog, if not seen can hardly be imagined.

This dust will cause not only a grave loss of man-power, but of vehicles, in mechanized forces unless some means of preventing it is found.

The casualties and diseases to account for this loss of man-power are :
 (a) Death or serious injuries from crashes. This statement is not an exaggeration when it is considered that it is impossible for any driver to see much when a mechanized force is on the move, unless his sight can be confined to the tarmac strip where such exists. This will necessitate legislation to keep bullock carts, etc., off the centre of the road and that may be difficult to enforce. (b) Severe conjunctivitis and trachoma, etc., the result of the irritation caused by this dust. (c) Acute inflammation of the air-passages, the result of the continual inhalation of dust. (d) Certain bowel diseases such as the dysenteries, diarrhoea, etc., from ingestion of the causal organisms with dust.

With regard to prevention many methods are open to us. Firstly, tarmac the whole width of the roads which would prove very costly and take a considerable time to complete. Secondly, proper legislation to keep slow-moving traffic off the centre of the road. This, so late in the day, is almost impossible to achieve now and might still not control the dust raised by this slow traffic. Thirdly, where mechanized forces have to pass each other, one of them will have to remain stationary to allow the other to pass. Fourthly, there is consideration of the distances between vehicles. This measure will not prove of great use because there is little wind and, consequently, the dust hangs in the atmosphere. So much is this so that spacing even up to 100 yards interval will fail to give sufficient visibility to drivers, where tarmac does not exist. Fifthly, protection of the men from dust nuisance. The gas mask would appear to be ideal for this, but it still remains to be proved whether it could be borne for a very long period during a journey in the hot weather in India. Sixthly, protection of the eyes by goggles—perhaps the goggles used for protection against mustard liquid would prove the most suitable for this purpose without adding to the man's equipment. Seventhly, some form of filter pad over the mouth and nose capable of absorbing the dust from the atmosphere inhaled. Eighthly, although it is not proposed here to consider diseases due to the accumulation of exhaust gases in closed armoured vehicles, such as tanks, armoured cars, etc., which have been carefully studied at home and as far as possible eliminated, still, in India during the hot weather, the prevention of effects of heat inside these vehicles will have to be carefully considered. This may necessitate the installation of fans to provide better ventilation and air movement and, possibly, inside lining with some form of material which is a non-conductor of heat.

(B) The introduction of mechanization means the gradual disappearance of the horse and mule and consequently their litter. This means a very large hygienic problem of conservancy in India, viz. the disposal of nightsoil. With the exception of the ports and very large cities, the disposal of nightsoil all over India is by incineration, which depends on litter for its normal working. This method of disposal is primitive and has existed throughout the ages in India and, though it may be considered as a temporary measure for camps, one will not be sorry to see the end of it in modern times. The great drawback of this method is that it is associated with open latrines and handling by sweeper personnel, who can be counted upon to follow the line of least resistance where possible. The problem of disposal of nightsoil will soon become acute. There are many alternative methods :—

(1) Naturally the most satisfactory method of disposal is by a modern water carriage system of disposal. But in a vast country like India, it is obvious that the enormous cost to be borne by carrying out this method will not be possible in the near future. This up-to-date method can only be carried out gradually in the next century.

(2) *Septic Tanks*.—The next satisfactory method of disposal. This method will be costly though much less so than number (1). But there will eventually be a saving in the huge sweeper establishment, crowley carts, etc., and it will do away with the most objectionable open latrines.

(3) *Deep Bored Hole Latrines*.—Another very satisfactory method, apparently that of choice, provided it proves to be possible in many parts generally, but this depends on the level of subsoil water. As compared to (1) and (2) this method is cheap to install and will eventually prove much more economical than any other method in that all the paraphernalia of conservancy establishments, sweepers, crowley carts, incinerators, etc., will be saved. It has the further advantage that it does away with open latrines.

(4) *The Indore Method*.—This method would afford a source of revenue in sale of a valuable manurial soil. The method, to be successful, must be worked by trained establishments and it has the great disadvantage that it does not do away with open latrines.

(5) *Entrenching*.—Here again we shall be left with open latrines and an added source of fly-breeding, which is almost impossible to control unless stringent supervision is carried out with adequate preventive measures.

Now that incineration must disappear, it can only be hoped that, for the sake of prevention of bowel diseases, which are the scourge of India, one of the first three methods will be adopted.

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Editorial.

NOTES ON JOHN TYNDALL.¹

WILLIAM BULLOCK, whose book, "The History of Bacteriology," is the inspiration of this article, deserves well to be remembered by officers of the Royal Army Medical Corps. He was, indeed, a true and loyal friend whose profound knowledge of the literature of his subject was always at the disposal of those in need of it and whose goodwill was as freely given as that knowledge itself. We have often been obliged to consult him about some reference which it was difficult to trace or as to some bacteriological problem which had to be rejected or established ; and never without effect !

It is, therefore, with a feeling of piety as well as of admiration and respect that we attempt to deal with one of the characters to whom he re-introduces us in his work.

Paul De Kruif has already given to bacteriologists and others his vivid sketches of Antony van Leeuwenhoek (1632-1723) and Spallanzani (1729-1799), the most successful of the earlier workers in this field ; and, to those in need of a *romantic* appreciation of the subject, we commend De Kruif as the more interesting of the two. Bullock, indeed, attempts to keep romance out of the picture, as if it were unworthy of notice, but it will not be denied and creeps back unbidden ! There are many others dealt with in the book, just as necessary to true history as the great men noticed by De Kruif, and, indeed, there are even those whose period was unassisted by the microscope but whose wise speculations on the causation of disease, though unaccompanied by any observations on the organisms concerned, are found worthy of a place in Bullock's History. Notable amongst these was Hieronymus Fracastorius, who, speaking of consumption, maintained that it was due to a minute and invisible germ and that it was only infective for the lungs and not for other organs. "It is extraordinary," he says, "to see in families up to the fifth and sixth generation all the members die of phthisis at the same age." Hydrophobia, which he noted as only propagated by the bite of a mad dog, and many other diseases, were dealt with shrewdly by this close observer of the phenomena of transmission, if not of the causation, of infective maladies.

Tyndall (1820-1893) was not a doctor but a physicist thoroughly trained in the accurate devising and planning of experiments. It was this quality which drew him to test for himself the theories of Bastian whose whole weight had been thrown—very effectually, be it said—on to the side of spontaneous generation. It is especially pleasing to us to find that Bullock places Tyndall on the very highest level.

¹ From "The History of Bacteriology." By William Bullock, F.R.S., M.D. Oxford University Press, London, New York, Toronto. 1938. Price 10s. 6d. net.

"Pasteur and Tyndall, the one a chemist, the other a physicist, neither of them medical but both trained in the most exact methods of experimentation, jointly accomplished the final downfall of the doctrine of spontaneous generation. Apart from the sporadic mutterings of Bastian down to 1910, no serious objections have been brought forward to challenge the conclusions of these two masters of experiment."

For ten years Tyndall had been studying radiant heat and its relation to gases and he had been struck with the difficulty of removing particles that might be floating in the atmosphere. He found that these particles could be made visible by means of a powerfully condensed beam of light. He ascertained, further, that it was possible to burn all the motes out of a column of air by a flame, the space becoming black due to the absence of all particles from the heated air. Tyndall spoke of such particle-free air as "optically inactive" and he was able to demonstrate that air freed from particles, either through their gradual deposition or by the application of the flame of a spirit lamp, was also free from germs. In a specially designed chamber he was able to observe that the upper air in flasks, kept free from motion or jarring, became both optically inactive and also sterile, though the lower layers were full of the germs that had fallen from the upper spaces.

Tyndall made numerous experiments with filtered or calcined air and in hermetically sealed glass bulbs. "In 130 experiments made with infusions in bulbs boiled for three minutes in the oil bath, 100 remained sterile." Nearly a thousand tubes of infusions left exposed to the air were examined and all showed growth. This was very good, but why were thirty of those boiled and sealed found to be contaminated? And what of the experiments of W. Roberts, showing that, when infusions of hay were carefully neutralized, they could withstand three hours' boiling before they were sterilized?

"After a tedious enquiry involving hundreds of experiments Tyndall found that infusions made from old dried hay were, in general, much more difficult to sterilize than those made from new fresh hay. The results, however, were variable. Returning to other infusions with which he had been so successful in 1876, he now found that he could no longer sterilize them in closed chambers by boiling for five minutes as he had previously been able to do."

Tyndall, faced with observations which seemed to support the doctrine of spontaneous generation, prepared to leave the Royal Institution and in fact transferred all his apparatus to the Jodrell Laboratory at the Royal Gardens at Kew. Repeating his experiments once more, he found that infusions which, in the Royal Institution, could not be rendered sterile after 200 minutes' boiling, were completely sterilized in five minutes at Kew. He returned to the Royal Institute and had a shed erected on the roof, the walls scrubbed with carbolic and the attendants placed in overalls. Boiling for five minutes now sufficed to sterilize the infusions. The explanation was that on the floor of the laboratory had lain bundles of old hay which, when disturbed, yielded up a highly infective and heat resistant dust. "A

simple wave of a bunch of hay in the air of the shed made it as infective as the air of the laboratory."

These experiments and others, in one of which a bulb filled with fluid under conditions which seemed to promise sterility, and then exposed to a boiling temperature for eight hours, was still found to be contaminated at the end of it, served to convince Tyndall that certain bacteria have phases, one of which is relatively thermolabile and killed at 100° C. in five minutes, whereas another is almost indestructible by heat. This idea was completely confirmed by the observations of Ferdinand Cohn who, in the same year (1877) "demonstrated in the case of the hay bacillus, the existence, development, germination and heat resistance of the endospore."

Tyndall, in consequence of his experiments, hit upon the method of fractional sterilization, "tyndallisation" as we now call it, and described it in a letter to Huxley on February 14, 1877, as follows:—

"Before the latent period of any of the germs has been completed (say a few hours after the preparation of the infusion) I subject it for a brief interval to a temperature which may be under that of boiling water. Such softened and vivified germs as are on the point of passing into active life are thereby killed; others not yet softened remain intact. I repeat this process well within the interval necessary for the most advanced of the others to finish this period of latency. The number of undestroyed germs is further diminished by this second heating. After a number of repetitions which varies with the character of the germs the infusion, however obstinate, is completely sterilized."

He was able to show that discontinuous boiling for one minute on five successive occasions could render an infusion barren, whereas one single continuous boiling for one hour might not.

Tyndall's personality was at the root of the wide diffusion of this knowledge which followed. "Whereas the personality of Pasteur," says Bullock, "inspired something of the nature of opposition, Tyndall's magnetic personality, his exact technical methods, the logic of his interpretations, and the clarity of his literary compositions were acceptable to a large number of intelligent people." The method of fractional sterilization is widely used in our laboratories but it is to be feared that, fifty or so years after his death, many employ it without a thought for the great Englishman who invented it!

There are many good things in this little book. The accounts given of the work of Pasteur, Robert Koch, Cohn, and Davaine are all excellent and interesting. Notes are given of Ehrlich, Neisser, Loeffler, Bastian, Needham and many others. There is a photograph of Emile Roux which is of arresting quality, full of the gentle humour and quiet alertness which were among the endearing qualities of that great savant.

But we find nothing in it more admirable than the short sketch here quoted of John Tyndall.

Clinical and other Notes.

A LOG OF HUMAN RABIES.

BY MAJOR P. F. PALMER,

Royal Army Medical Corps.

THE case sheet notes of Serjeant M., 2nd Suffolk Regiment, aged 27, total service $6\frac{1}{2}$ years, India $5\frac{1}{2}$ years, are as follows :—

December 12, 1938 : A comrade reported that patient was in bed ill and sweating.

6 p.m. : He was admitted to hospital the same evening. On admission his temperature was $99\cdot6^{\circ}$ F., pulse 70. Patient complained of extreme cold and shivering and at the same time sweated profusely and gave the following history : The previous day he woke up in the morning feeling very cold and weak, and when he tried to walk he was inclined to fall, and when he attempted to take any food it seemed "to go down, but stuck and came back again"—he therefore gave up taking food. On physical examination there were no signs of disease in any system. A blood slide taken did not show malaria parasites, but seemed to indicate a leucocytosis. In view of an illness in June, 1938, in which fever, profuse sweating and muscular weakness occurred, and in which streptococci were isolated from the blood, prontosil therapy was instituted. It was later noticed that the pulse was fast and feeble.

8 p.m. : Asked for water—unable to swallow when given, owing to nervous spasm—pupils wide and staring ; patient looked very frightened ; appeared to settle down to sleep later. Sweated profusely all night (rubbed down and changed to fresh bed three times). Unable to take fluids early part of night, took sips of water with difficulty later on. Told night sister he felt very frightened.

December 13 : Condition poor, severe breathlessness present. 3.30 a.m. : O.M.O. sent for on account of rapidly weakening pulse. Previous therapy continued—intramuscular prontosil 5 c.c. Marked improvement in condition between 6 and 8 a.m.—able to swallow a small amount of tea. Passed urine 4 ounces. On M.O.'s morning round, patient exhibits terror, pupils dilated, looks apprehensive and is jumpy. Voice hoarse, still sweating, skin cold—asked for a drink of water, and the following events occurred. Patient greedily seized the mug and on attempting to raise it to his lips, his arms, head and neck stiffened and he appeared as if he was composing himself to drink it. On any further attempt to hold the mug to his lips, he shook violently and became breathless (rapid respiration like a panting dog). On examination his tongue was heavily coated, and there was a marked

body odour. Muscle tone was normal—cranial nerves were healthy, knee jerks slightly exaggerated, plantar reflexes normal—sensation normal. No cervical or spinal rigidity, no pain, nor headache. Mind is alert and he gives the following history : Illness really began on Saturday (December 10) when he complained of stomach and backache and had difficulty in passing water as it used to stop and then start again. During the last night he mentioned that he had terrible nightmares and sexual dreams—shipwrecks and chasing women through empty houses.

December 13 : Tetanus or rabies was thought of—the former unlikely—no continued rigidity, no masseter spasm. It was noted that on returning to the bedside to ask a question or for any other purpose, the patient started violently and a panting spasm ensued, and in some of these spasms muscle tone was increased and the limbs became spastic for a few seconds—the length of these spasms was up to half a minute. 12 noon : It was decided to give him desensitizing doses of A.T.S. and to do a lumbar puncture and give intraspinal A.T.S. together with intravenous A.T.S. glucose and insulin. All desensitizing injections brought on spasms as described, likewise the attempt to administer a general anæsthetic—sodium evipan 3 c.c. intravenously caused cardiac collapse and patient was only rallied with intravenous coramine, as a result of which he became talkative and mildly hilarious and was able to gulp down a little fluid. Rectal paraldehyde $\frac{1}{2}$ ounce together with mist. 2/15 one ounce in glucose 6 ounces given *per rectum* to gradually induce anæsthesia, was returned at once with a large amount of fæces. Spasms began again with a certain amount of muscular contortion.

2.30 p.m. : Intravenous glucose 16 ounces given ; all manipulations produced spasms—rectal paraldehyde repeated 4.30 and 7 p.m. Passed urine 4 ounces 5.30 p.m. Oranges sucked and sips of water taken with great difficulty—boiled egg attempted but produced great distress. During evening condition worsened. External stimuli produced spasms, muscular contortions became more generalized, patient became violent.

8.30 p.m. : Condition grave, skin cold and clammy, colour cyanosed, pulse weak, respirations becoming more difficult all the time. Coramine 1 c.c. given 9.30 p.m.

11 p.m. : Respirations acutely distressed, look of terror more marked, patient salivating freely. Saliva dripping from mouth. Called for black coffee, attempted to lap it which caused severe spasm. General muscular contortions. Throwing himself about and gripping anything within reach. Attempted to damage himself. Patient fully conscious, voice a husky whisper—calf muscles aching.

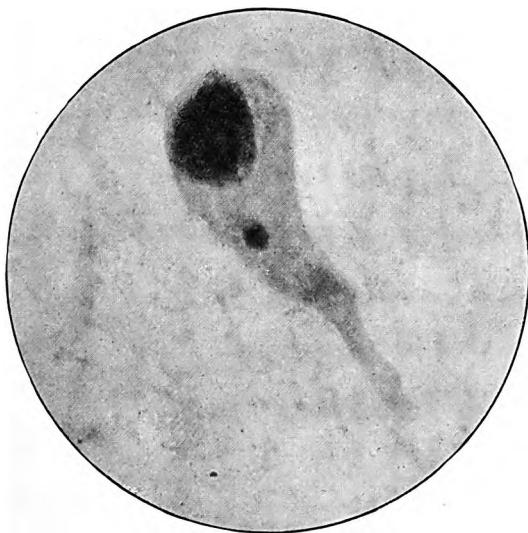
December 14, 2 a.m. : Extremely violent. Patient becoming weaker—complete muscular paralysis immediately after spasm. Fully conscious until death from cardiac and respiratory failure at 3 a.m.

December 14 : *Post Mortem Examination.*—Marked staining—brain showed congestion. Lungs engorged—slight œdema. Heart healthy,

moderate engorgement of stomach and small intestine, contents a little thick mucus. Liver, kidneys and spleen healthy. Blood very dark and liquid.

Pathological Report. Negri bodies seen in brain sections.

Epidemiology.—Patient was Garrison Provost Serjeant and a few months ago was for some time "Dog Shooter." It appears that he was responsible for seeing that dogs suspected of rabies and which were under observation at the Cantonment Veterinary Hospital were properly fed. It was no part of his duty to touch any such food, a sweeper being employed; patient was not asked directly if he had been bitten at any time by a dog. The question was put indirectly and it was felt that a man of his intelligence would have mentioned it had it been so. The Veterinary Jemadar states that about four to six months ago patient asked his advice about his own dog which was "acting queer." He said that it had not bitten him, and



he was advised to tie it up for observation, instead of which he destroyed the dog. After full inquiry no further evidence could be obtained.

Prophylaxis.—Attendants wore gowns and gloves. All discharges were immediately destroyed—case isolated. Fumigation of bunk and disinfection of all bedding carried out. All messing utensils in his mess boiled.

All personal kit disinfected by steam or cresol swabbing—pipes, hair brushes, razor, shaving kit, whistle destroyed. All attendants undergoing anti-rabic treatment.

DISCUSSION.

The criticism has been made that there was very little evidence, if any, for the possible diagnosis or treatment of tetanus. This I agree with, but since a member of the staff suggested the possibility, it was only fair to give the patient the benefit, no matter how unlikely it may be.

When admitted to hospital in the evening the patient summed up his complaint in some such words: "that he was feeling ill and weak and had taken nothing for two days." The latter remark is so commonly made that no further meaning was attached to it other than that the patient had no desire for food. It was not realized that this was the exceptional case where the patient meant that he had a physical impediment to swallowing food. The first that I knew of the patient's inability to take food was after prontosil therapy had been continued in the early morning, when an orderly casually mentioned that the patient did not seem to be able to swallow properly, when the possibility of rabies became evident for the first time. The strange feature at the beginning of the case was the leucocytosis of 30,000, of which 92 per cent were polymorphs, which suggested that the disease might again be streptococcal in origin.

In some stations it used to be the practice for the dog-shooter to cut off tails or an ear as evidence of the destruction of an animal so as to balance his cartridge account. This appears to be a very dangerous practice since at any time the patient may cut through infective nervous tissue and so acquire infection.

I am indebted to Captain J. F. Wilson, R.A.M.C., for the photomicrograph.

Permission has been kindly granted by Lieutenant-Colonel E. P. Allman Smith, Commanding British Military Hospital, Mhow, to send these notes for publication.

THE IMPROVEMENT IN THE BACTERIAL POPULATION OF A WARD IN A C.C.S.

By MAJOR G. V. JAMES,
Royal Army Medical Corps.

A SURGICAL ward had been installed in a disused hall, the ventilation of which was very bad, and improvements were rendered more difficult on account of the black-out regulations.

Patients complained particularly about the "stiffness" of the atmosphere at night and use of the kata thermometer confirmed the stagnation and discomfort.

At the same time as this kata experiment was performed blood-agar plates were exposed on the floor at the two ends of the ward. These plates were then incubated at 37° C. for forty-eight hours and total counts made at the end of this time. The plates were exposed at different periods during the night and the average deposition of bacteria per hour was thus obtained.

TABLE I.—DEPOSITION OF BACTERIA PER HOUR.

Time.	End A.	End B.
10 p.m. to 4 a.m.	75	84
4 a.m. to 6 a.m.	130	145
6 a.m. to 8 a.m.	103	120

During the period 4 a.m. to 6 a.m. the patients were awakened, the floors, etc., swept, and hence the higher bacterial density can be understood ; further, End B had no doors or windows and was less well ventilated than End A.

Knowing the high bacterial count of dust, it was suggested that if the floor could be scrubbed down, instead of merely washed over, the count could be lessened. To this end scrubbing brushes were attached to broom-staves, and the floor "scrubbed" by the cleaners using the improvised tools. After three weeks of this cleaning the bacterial count was repeated.

TABLE II.—DEPOSITION OF BACTERIA PER HOUR.

<i>Time.</i>				<i>End A.</i>		<i>End B.</i>
10 p.m. to 4 a.m.	..	..	..	43	..	52
4 a.m. to 6 a.m...	..	..	..	84	..	98
6 a.m. to 8 a.m...	..	..	..	59	..	63

In an attempt at further reduction in the bacteria, an improvised apparatus was constructed in which air from an automatic air pump, run off a lorry engine, was bubbled through a bleaching powder solution, the hypochlorous acid vapour so produced being distributed through the ward by an electric fan placed over the containing vessel.

The air pump was connected by rubber tubing to a tube made from a petrol tin sealed at one end. In this tube a number of small holes were made in order to break the air into numerous small bubbles.

A filtered bleaching powder solution, neutralized with hydrochloric acid, was placed in the containing vessel and the air bubbled through continuously. Again blood-agar plates were exposed and showed a further reduction as follows :—

TABLE III.—DEPOSITION OF BACTERIA PER HOUR.

<i>Time.</i>				<i>End A.</i>		<i>End B.</i>
10 p.m. to 4 a.m.	..	..	..	22	..	27
4 a.m. to 6 a.m...	..	..	..	37	..	45
6 a.m. to 8 a.m...	..	..	..	28	..	32

It will be seen that risk of infection can be reduced easily, even in a stagnant atmosphere, by moist hypochlorous acid. This can be produced from readily available chemicals and with improvised apparatus.

HERPES ZOSTER, WITH ASSOCIATED GENERALIZED VARICELLIFORM ERUPTION.

BY MAJOR A. GIRDWOOD FERGUSON, M.B., Ch.B., F.R.F.P.S.GLAS. (P.)
Royal Army Medical Corps.

THAT fairly common disease, herpes zoster, is well known occasionally to coincide in the same patient with an attack of varicella, and cases of zoster to occur in association in the house and neighbourhood with small epidemics of varicella, particularly among young persons. The usual

theory as regards the above is, of course, that zoster is caused by the same filter-passing virus as is varicella, and that the clinical difference lies mainly in the fact that in the former the virus is present only in the cerebrospinal fluid, while in the latter a blood-stream infection exists. This theory, though attractive, is at present still conjectural.

What is still more often seen, however, although it is not by any means a common occurrence, is the occasional case of herpes zoster with which there is associated a scattered and generalized varicelliform eruption, existing without the associated systemic disturbance, slight though this undoubtedly is, which is usual in true chickenpox. Two such cases have recently come to my notice, occurring in soldiers admitted to the Skin Division of a Scottish Military Hospital.



FIG. 1.

Case 1.—Private M., aged 46. Admitted to hospital, April 22, 1940. On admission, patient complained of considerable neuritic pain in the entire left upper limb of two or three days' duration.

On examination he was found to be suffering from a very severe herpes zoster, involving the skin of the medial aspect of the entire left upper arm, the groups of vesicles being in many places of a hæmorrhagic character. The distribution of the eruption indicated involvement of the posterior root ganglia from which are derived the fifth and sixth cervical and the second thoracic spinal nerves (fig. 1).

On further examination, the skin of the entire body surface, except that of the face and scalp, was found to be the site of a scattered papular, vesicular, and

pustular eruption of varicelliform character, the lesions being at characteristically different stages of evolution. There was slight elevation of temperature (99° F.) and the pulse-rate was slightly increased.

There was no history of very recent inoculation or vaccination, although he had received the usual routine inoculations since joining the Army. He stated that as far as he knew he had never had chickenpox.

On admission he was isolated and the herpes was treated by means of applications of surgical spirit and dusting powder. Aspirin and other analgesics were required to allay the pain which was intense and prevented sleep. The generalized eruption was treated by frequent dabbing with simple calamine lotion containing menthol (grs. 2/oz.).

A steady recovery was made as regards the skin, while the temperature was



FIG. 2.

normal within forty-eight hours of admission. The generalized eruption had vanished by the seventh day, but the herpes itself proved slow to heal and required frequent changes of treatment in order to obviate secondary infection of some of the groups of vesicles. The coincident neuritic pain proved, however, very intractable, and when he was finally discharged, four weeks after admission, he required readmission to the Medical Division for treatment of this residual condition.

Case 2.—Rifleman W., aged 27. Admitted to hospital July 12, 1940. On admission, patient complained of severe hemicranial headache (left) of three days' duration and of a "rash" on the skin of the forehead just above the left eye.

On examination he was found to be suffering from a severe herpes zoster, involving the skin of the occipital, parietal, and frontal regions of the left side of the scalp, that of the left zygomatic area and of the left side of the chin being also affected. The distribution suggested involvement of the ganglia from which are derived the fifth cranial and the second cervical spinal nerves (fig. 2).

Further examination revealed the presence of a scattered and generalized papular, vesicular and pustular eruption of varicelliform character, slight associated pruritus being also present. There was no systemic upset.

He gave no history of any recent vaccination or inoculation, and stated that, as far as he knew, he had never at any time suffered from chickenpox.

On admission he was at once isolated, and the herpes treated by means of applications of surgical spirit and dusting powder, analgesics being also necessary to settle the troublesome headache. The eruption on the body was, as in the previous case, treated by means of dabbing with *lotio calaminæ* containing menthol.

As before, the generalized eruption quickly settled but the herpes proved slow to heal. The patient was discharged on July 23, 1940, but required a further two weeks' treatment before the latter condition had finally cleared up. The neuritic pain in this case, however, died gradually away as the skin healed, and on final discharge had entirely subsided.

As regards the above, it is interesting to observe that on neither occasion was any associated case of herpes zoster or varicella noted among the remaining patients in the Skin Department. The attached R.A.M.C. personnel were similarly unaffected.

The question of the causal virus in cases of zoster and varicella is an extremely interesting one and it is attractive to consider one condition to be a variant of the other and the cause to be a common organism. The well-known fact, however, that an attack of typical chickenpox may follow within a few weeks of a herpetic condition, when immunity should presumably be high, is very difficult to explain if this is the case.

My thanks are due to Dr. W. Martin, Medical Superintendent, Stobhill Hospital, Glasgow, and to Sister Collins of the X-ray Department of the Hospital, for their kindly co-operation and help with the photographs.

A SELF-OPERATING SYSTEM OF DRAINAGE BY SYPHONAGE.

BY CAPTAIN H. B. L. DIXON,

Royal Army Medical Corps.

DURING the wet season in the early months of the War, many gun-pits, slit trenches, projector pits and sound-locator pits were put out of action by flooding.

In many cases this might have been prevented by the provision of drains at the time of construction but, generally, there was such haste in their preparation and flooding took place so suddenly that many Searchlight Units found their sites inundated overnight.

Units of the Auxiliary Fire Service were called in and flooded pits, etc.,

were pumped dry, but some sites were so outlying that it was impossible to rely upon such assistance and, in any case, the relief was of a very temporary nature so a system of syphonage was evolved and was found to operate very satisfactorily.

The principle upon which a syphon works is, perhaps, so well known that elaboration is unnecessary, but it will simplify this suggestion if its salient features and foibles are mentioned.

If an airtight tube is filled with water and one end inserted into a vessel (which might be a gun-pit) and the other end released at a point lower than the level of the water in the vessel it will discharge water at its lower end until (a) the level of the water in the vessel has fallen to the exact level of the lower end of the tube; (b) the vessel is emptied, in which case the lower end of the tube has been set at a level below that of the bottom of the vessel; (c) air has been allowed to enter the tube, in which case, syphon action has been destroyed and the tube will again have to be filled with water before action will recommence.

In the case of (b) above, it is almost certain that air will rush into the tube, once all water has been drained from the vessel, and the condition (c) will be automatically set up.

In practice, the condition (a) is the one to be aimed at and it follows that before syphonage can be established certain topographical conditions are essential. These are (1) there must be some fall in the land and (2) water must be led away to a distance sufficient to ensure that, on its discharge, it will not interfere with the operation of the site, due to flooding at some other point.

On sites where there was a very appreciable slope, say a fall of one in fifty, it was found more economical to dig a drain in the form of a trench away from the flooded pit. A fall so slight as one in a hundred and twenty has been satisfactorily applied to syphonage.

It would be of little use employing a syphon which would require to be re-started whenever its services were required so, in its final setting, it will be necessary to determine exactly to what level it shall empty a pit and to ensure that air shall not enter at either end. To effect this a water seal is made at each end of the tube. These are not complicated. At the upper end the tube rests in a sump consisting of an oil drum, which always contains water. At the lower end the tube is fixed with its mouth pointing upwards so that it too is always filled with water. The level at which the mouth is fixed determines the level to which the water falls in the sump.

Before describing the mode of dealing with an already flooded pit it might be as well to outline the appearance of a site upon which the syphon is in full operation.

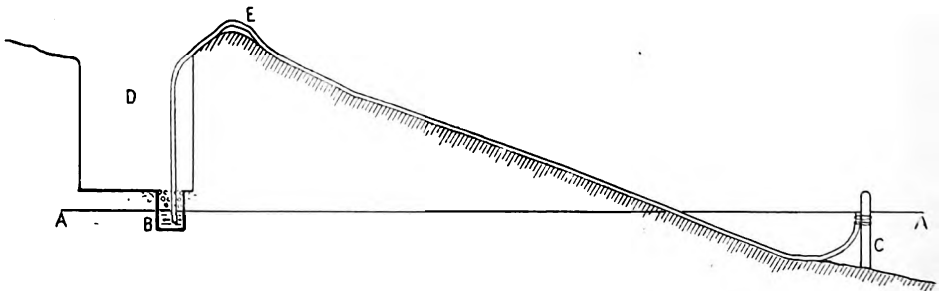
In the gun pit, trench or projector pit from which the syphon is operating a series of shallow drains has been dug, leading to a sump situated at the lowest point, the sump consisting of a five gallon oil drum, open at the top, with holes perforated through its upper half, sunk into the floor of the pit

and packed round with clinker. The drains are also filled with clinker and the pit or trench is equipped with duck boards. Neighbouring pits or trenches have been made to communicate with and drain into this common sump.

There is about eight inches of water in the sump but the floor of the pit appears quite dry.

The end of a hose pipe dips into this water to a point about an inch from the bottom of the sump and the pipe is firmly fastened to an "A" frame in such a manner that the end cannot be removed from the sump or brought above water level. The hose is of three-quarter inch internal diameter, and is not of an expensive pattern.

At a point on the lower aspect of the site there is a stake, firmly driven into the ground, to which the other end of the hose pipe is immovably fastened, with its mouth pointing skywards. This stake is about a hundred yards away from the pit and it is seen that a slow dribble of water emerges



Line A—A represents common level of water in sump and at outlet. B, sump half full of water. C, stake. D, pit or trench. E, hose.

from the hose pipe at this end. The end is about two feet above ground level.

Between its ends the hose is buried, turf deep, to avoid injury and to protect it from frost.

If the fastenings are undone at this lower end and the mouth of the tube raised two inches it will be seen that the water falls to about two inches inside the hose and, if the end is fixed at this new level it will be seen that before it recommences to flow, the water in the sump has become two inches deeper. In this way a very fine adjustment can be carried out and, in practice, an adequate depth of water should be maintained in the sump, with the hose well below the surface as, in windy weather, the varying air pressures in the pit cause some surging in the water contained in the hose and the inertia of a hundred yards' column of water can cause a quite considerable lowering of the water level in so small a sump.

Continuous moderate rain has never caused appreciable flooding of pits equipped with such a syphon and such flooding as may occur following

a cloudburst causes the syphon to operate with increased vigour owing to the increased discrepancy between the level of the water in the pit and the level of the outlet of the hose.

Human curiosity has been the sole cause of breakdown in the syphons I have set up. There seems to be a fatal fascination about the upper end of the hose and, in spite of warnings, men will lift it out of the sump to see what is going on or, perhaps, what is not going on. Usually they interfere during dry weather when, owing to a cessation of inflow there is also a cessation of outflow which, no doubt, gives the impression that all is not well. The only remedy is to fasten the hose very securely in place at both ends.

I anticipated that failure might arise from the separation of air from the water contained in the hose, especially as it is retained under negative pressure at its upper portions, but this has never materialized and one syphon left strictly to itself for a period of five months gave uninterrupted service until someone drove a pick into it and destroyed its action.

The filling of the hose with water is about the only other thing upon which advice might be offered. This is done from the lower end and a stirrup pump is the ideal instrument for the purpose. The pump and two or three pails of water are carried to a point which may be judged amply low enough to represent the approximate position of the ultimate outlet and the hose is spread in a fairly straight line between this point and the pit which it is intended to drain, leaving a sufficient length of hose at the upper end to reach the bottom of the pit which is, presumably, full of water.

A man stands at the upper end, holding the hose aloft with its mouth pointing upwards.

The pump is connected to the hose and the water from the pails is pumped into the hose, working from one pail only, replenishing it as need be from another pail and taking care that no air is sucked up and forced into the hose during the operation.

The man at the upper end gives a hail when water commences to issue from his end and a further half pail or so of water is pumped vigorously through to force out any air that might still remain in the hose.

At a signal the man at the upper end places his thumb over the end of the hose and plunges his hand, thumb still in place, under the water in the pit. Pumping should continue throughout this operation which only takes a few seconds.

Once the upper end is well submerged the pump is disconnected at the lower end and, assuming that this is situated at a sufficiently low level, the syphon commences to operate. If thought necessary a perforated tin may be fastened to the upper end, to act as a filter, but care must be taken to keep the end of the hose submerged whilst fixing this.

As the water level falls the speed of the syphon's action should be watched and when there is only about three inches of water left it is a good plan to seal both ends of the hose with corks during the digging and sinking of the sump. This is, of course, a very dirty job in a pit which has been

flooded for some time but, in the summer, before flooding has taken place, most pits are fairly dry and a great deal of labour might be saved by preparing pits, etc., which are known, from previous experience, to be subject to flooding and installing the syphon before conditions make the task a difficult one.

Lastly, the final level of the outlet should be arrived at by a gradual process, an inch or two of adjustment being made at a time until the exact position has been found, when it should be very firmly fixed to its stake, as also should the upper end.

It is cheaper in the long run to buy new hose which can be held certain of being non-porous. Incidentally, hose which had lain out all through the winter and had been frozen solid with its content of water, was found to function quite satisfactorily in the spring, there being no fractures, and it retained its elasticity quite well.

Current Literature.

IRVINE, R. Sympathetic Ophthalmia. A Clinical Review of Sixty-Three Cases. *Arch. Ophthalmology*. 1940, July, v. 24, No. 1, 149-67.

From an analysis of 63 cases of sympathetic ophthalmia, supported by a review of much recent literature, Irvine holds that if enucleation is to prevent the development of sympathetic uveitis, it must be done before two weeks have elapsed from the time of injury.

Once sympathetic uveitis has developed, enucleation of the exciting eye has no effect on the course of the disease, and this eye should be retained, if potentially useful, as it may eventually be the better eye. From the available data there is no indication that the exciting eye acts as a focus of infection "spilling over" into the sympathizing eye.

Considering the frequency of occurrence of sympathetic ophthalmia (1 per cent of all perforating injuries), attempts to save severely damaged eyes, especially if the lens is injured, are not justified if the other eye is normal. A distinct possibility of sympathetic uveitis must be considered when operation is contemplated on eyes nearly blind from any cause, as for instance, hæmorrhagic glaucoma.

The progress of symptoms in the course of the disease may be of diagnostic importance : (a) The exciting eye is always irritable at the onset of symptoms in the sympathizing eye. (b) Keratic precipitates are nearly always present in the sympathizing eye, and make their appearance in this eye before they appear in the exciting eye. Uveitis developing about six weeks after injury or operation to the fellow eye, showing at the onset no keratic precipitates, has about a 10 : 1 probability of not being sympathetic uveitis.

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The wounds exciting sympathetic uveitis, whether traumatic or operative, characteristically show incarcerated lens substance or uveal tissue. This fact, and the incidence of the condition after various types of operations, suggests that iris inclusion operations are more likely to cause complications with sympathetic uveitis than trephine operations; they further suggest that repair of perforating injuries should include freeing the wound of incarcerated substance and firmly uniting the tunica fibrosa.

ARNOLD SORSBY.

Reprinted from "Bulletin of War Medicine," November, 1940.

FERREE, C. E. & RAND, G. Testing Fitness for Night Flying; Speed of Change of Adjustment of Eyes for Intensity of Light and Distance of Object. *Amer. J. Ophthalm.* 1939, June, v. 22, 655-60, 2 figs. [10 refs.]

The studies by C. E. Ferree and G. Rand, of Baltimore, in connexion with the visual problems of flying are well known. In the present paper they describe an apparatus called the "Electrical Tachistoscope," which they consider very closely imitates the visual conditions to which the night flying pilot is exposed. "The instrument" they say "makes possible (a) the use of a set of very sensitive tests which takes into account as no other tests do both the motor and the sensory functions of the eyes in just the proportion that they occur in the act of seeing objects in different directions and at different distances, (b) the testing of the dynamic speed of vision with either the oculomotor or the accommodative feature emphasized, and (c) the measurement of the time required to change from near to far and from far to near in combination or separately." In the summary they maintain that this Tachistoscope records speed of adjustment of the eyes not only for change of distance but also for change of intensity of light (speed of adaptation).

The apparatus consists of a timing mechanism and three shutters, electro-magnetically operated and so arranged as to expose in immediate succession a near test object on the left, a far test object in the middle and a near test object on the right. The test objects consist of a letter "E" which can be rotated in four different positions to give an objective check on judgment.

A mirror device is employed for the far test object in order to reduce floor space requirements. The distance of the far object and the lateral separation of the two near test objects can be varied. A tubular lamp illuminates all the test objects and is so adjustable that it may be made to illuminate them equally or not as required.

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D.C. motor, capable of adjustments to varying speeds so that the speed of the commutator can vary between 6 to 30 revs. per minute.

The total duration of all the exposures can therefore be varied from 10 to 2 seconds.

P. C. LIVINGSTON.

Reprinted from "Bulletin of War Medicine," November, 1940.

COLE, P. P. **War Injuries of Jaws and Face.** *Post-Graduate Med. J.* 1940, July, v. 16, 233-44, 15 figs. (7 on 2 pls.)

The author considers cases with gross injury to the osseous framework of the jaws in addition to soft tissue damage. Segregation is stressed, in that it encourages specialized treatment and nursing whilst at the same time having a beneficial psychological effect on patients suffering from similar disabilities. Treatment should be instituted at the earliest possible moment and should be under the uninterrupted surveillance of expert dental and plastic surgeons. The restoration of function is much more important than cosmetic considerations and, therefore, the bony lesions should be dealt with first. "Broadly speaking, primary suture in cases associated with bony lesions is not to be recommended." The first-aid treatment prior to transfer to expert control should be confined to the suturing of skin to mucous membrane across the raw limits of the wound.

(1) *Toilet.* The toilet of the mouth is undertaken by irrigation under hydrostatic pressure, aided by the use of a soft tooth-brush.

The author recommends irrigations from a suspended reservoir, using lot. sod. chlorinat (B.P.) or chloramine T, $\frac{1}{2}$ to 1 per cent solution.

(2) *Nutrition.* Regular estimations of weight and caloric charts will regulate the feeding which may have to be done through a nasal tube or even a gastrostomy tube.

(3) *Dealing with Existing Teeth.*—Conservatism is advocated with a view to fixation and also because early removal results in the adherence of soft tissue to a more extensive area of raw bone, rendering more difficult the subsequent adaptation of a denture.

(4) *Occlusion Versus Union.* With the aid of a bone graft if necessary, the correct relationship between upper and lower teeth should be restored.

(5) *Splinting.* An attempt should be made to splint as early as possible.

The article was well illustrated and shows examples of metal splints, variations of the usual types. In the presence of a cicatrizing wound the open bite position is advocated. The maintenance of the buccal sulcus should be kept in view from the commencement of treatment.

(6) *Permanent Prostheses.* These are considered under the two headings of (1) purely dental and (2) prosthetic apparatus.

Some specialized procedures to deal with defects are considered :—

(1) *Non-union.*—Interference with function depends on the site of fracture and is more pronounced as the symphysis is approached. When

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there is no loss of tissue wiring should be adequate ; otherwise bone grafting should be employed, and three types are noted : (a) Pedicled bone grafts (mandible) ; (b) Free bone grafts (crest of ilium, ribs, tibia) ; (c) Osteoperiosteal.

(2) *Malocclusion*. The author advocates surgical interference for this.

(3) *Restorative procedures* are dealt with briefly in a series of basic principles, viz. :—

(a) Co-operation of dental and surgical expert is essential from the beginning.

(b) The result will be largely influenced by the plan of treatment jointly evolved.

(c) A flap with raw surface uncovered must not be used, because it will shrink.

(d) The cheek and lips for plastic purposes consist of two layers. Tissue for their repair can be of different extent and derived from different sources.

(e) Skin forms an admirable substitute for mucous membrane.

(f) Contraction occurs towards the more fixed point. The method known as "bringing the parts together" is particularly unsuitable in the presence of such mobile and easily distorted features as the angle of the mouth, lips and lower lid.

(g) The open bite position and suitable flanges can frequently be used with advantage.

(h) The epilatory effect of X-rays, particularly low voltage therapy, can be safely and effectively employed to extend the use of hair-bearing flaps to hairless areas.

(4) A *fistula of the parotid gland* heals up spontaneously and can be helped by X-ray, while a *fistula of the duct* calls for surgical intervention. The supplementary services of the X-ray in diagnosis, radiotherapy and physiotherapy are mentioned.

[This is an interesting note, and it is hoped that some statistical record of this treatment will allay the very generally held view that any form of X-ray treatment that can epilate permanently will also irreparably damage the skin. It should, however, nearly always be possible to arrange to use a non-hair-bearing flap as a lining membrane.]

H. D. GILLIES.

Reprinted from "Bulletin of War Medicine," November, 1940.

Reviews.

VADE MECUM OF MEDICAL TREATMENT. By W. Gordon Sears, M.D.Lond., M.R.C.P.Lond. Second Edition. London: Edward Arnold and Co. 1939. Pp. vii + 376. Price 10s. 6d. net.

The object of the author in writing this book was to provide in a convenient form and handy size an account of the treatment of those diseases most commonly met with in general practice. The conditions are arranged alphabetically for easy reference. In a few instances (the heart, ear and eye) the diseases have been grouped in one organ.

A case may be approached from various angles and alternative therapeutic procedures have been given. In some instances treatment which a general practitioner could not be expected to perform has been included for the sake of completeness and as an indication of the measures which might be carried out in hospital or by a specialist.

During many years of hospital experience the author has tried personally the methods of treatment recommended. Only those proprietary preparations which have been tested by the author or by his colleagues are included. Common affections of the ear and eye have been introduced to increase the usefulness of the book. That this purpose has been achieved is shown by the issue of a second edition in just over two years. Main advances in therapeutics have been included in this edition. These advances include the introduction of chemotherapy in the form of sulphanilamide and allied drugs, zinc protamine insulin, and Meulengracht's treatment of hæmatemesis.

We are sure this book will prove a most useful guide to treatment in the various spheres of medical practice.

FIGHTING FIT. By Colonel C. Arthur Webster. Pp. 15. Published privately.

This is the title of a small brochure which is an intimate chat on personal hygiene. It is designed for use in isolated and scattered units. The information that it contains is practical and told in simple language, which requires no explanation by an expert. It is a very useful little book and fulfils its purpose admirably.

C. C.

WOUND INFECTION. *Lancet War Primer*. London: *Lancet*. 1940. Pp. 96. Price 2s. 9d.

This short volume is a *Lancet War Primer*. It is divided into five sections: Surgical Principles and Practice, by W. H. Ogilvie; Bacteriology, by R. Cruickshank; Antiseptics, by L. P. Garrod; Biological Aspect, by L. H. Whitby; Chemotherapy, by G. A. H. Buttle.

There is an immense amount of practical and up-to-date information in this Primer which really deals with considerably more surgery than is indicated by the title. Every section is well worth study by any surgeon.

J. M. W.

A GUIDE TO HUMAN PARASITOLOGY. Fourth Edition. By D. B. Blacklock, M.D., D.P.H., D.T.M., and T. Southwell, D.Sc., Ph.D. London : H. K. Lewis and Co., Ltd. Pp. viii + 260. 122 Illustrations and 2 Coloured Plates. Royal 8vo. Price 12s. 6d. net.

This book was first published in 1931 and the fact that it has already reached its fourth edition is sufficient testimony of its popularity. It is a great favourite with both students and practitioners not only in this country but also in India, where the diagrammatic representations of the life histories of the commoner helminths are much appreciated.

Although no great changes are to be noted in the various editions amendments have been made in each issue.

As a practical textbook the volume might be improved by some extension of the chapter on the Examination of Material. Details might be given for the employment of Giemsa as a rapid stain : under certain tropical conditions Leishman's stain may be unsatisfactory. Mention might be made of the need for sealing of cover-slip faecal preparations to prevent drying and the value of hæmalum as a diagnostic stain for protozoal cysts when iodine fails—as is sometimes the case—to give a clear picture. In many countries *Chilomastix* is a very common intestinal flagellate and is more frequently seen in faecal preparations than *Giardia*, yet the authors pay scant attention to this parasite.

The book is chiefly concerned with helminthology and this section contains excellent descriptions of the commoner cestodes, trematodes and round worms. The diagrammatic illustrations and tables are additional attractions to a book that generally is to be found in the restricted library of the tropical practitioner.

H. J. B.

GARDINER'S HANDBOOK OF SKIN DISEASES. Revised by John Kinnear, M.D., M.R.C.P. Fourth Edition. Edinburgh : E. and S. Livingstone. 1939. Pp. xvi + 239. 70 Figures. 16 Coloured Plates, including a Frontispiece. Price 10s. 6d. net, postage 6d.

This handbook of skin diseases has been revised and brought up to date by Dr. Kinnear. It is arranged in a way that is most readable and helpful for students and also for general practitioners. The essential features of the skin conditions most likely to be met with in general practice are well tabulated and described clearly ; the treatments recommended are in accordance with the principles accepted by most dermatologists ; any preference shown by the reviser, for any one therapeutic agent, is supported ably by case results. A useful comment made by Dr. Kinnear is the following : " the importance of treating dandruff can hardly be over-estimated, as it has a bearing on many other diseases." He is not so helpful when he says of eczema, " all we can do is to help to let the disease wear itself out." Further, although he mentions sulphanilamide, he gives no details of any cases.

In discussing diagnoses, no mention is made of dermal leishmaniasis. Although this may be considered a rarer type of skin lesion, it is worthy of a thought and note when investigating isolated chronic ulcers. The coloured plates are very good (sixteen in all) and numerous good monochrome pictures illustrate the text. The letterpress is pleasing. There are some sentences which are clumsily constructed and detract from the ease of reading, and there is a split infinitive on page 159. These minor faults will undoubtedly be adjusted on further revision. This handbook can be thoroughly recommended.

D. H. M.

ROSE AND CARLESS' MANUAL OF SURGERY. Vols. I and II. Sixteenth Edition. By Cecil P. G. Wakeley and John B. Hunter. London: Baillière, Tindall, and Cox. Pp. 1,708. Price 30s.

The sixteenth edition of "Rose and Carless" will certainly maintain for this popular standard manual the reputation it already enjoys. The joint authors (Mr. C. P. G. Wakeley and Temporary Rear-Admiral J. B. Hunter) state that the first eight chapters have been rewritten and shortened. Nevertheless, it has been found necessary to add 90 additional pages in order to cover advances in the treatment of fractures, abdominal conditions and neuro-surgery. Over 300 new illustrations appear in this edition.

Surgeons—and particularly those actively engaged in the treatment of the wounded—will be inclined to turn to the chapters on Shock and Hæmorrhage and War Surgery in search of information. Here they will find much help, but these chapters will require amplification in the next edition if advances in traumatic surgery, which have been made recently, especially in connection with the theory and treatment of secondary wound-shock, are to be adequately represented.

D. C. M.

Notices.¹

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¹ These notices are for the purpose of acquainting officers with the latest developments in therapeutics, but do not imply that the preparations mentioned have been added to the list of authorized drugs.

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JOURNAL OF THE ROYAL ARMY MEDICAL CORPS

Corps News.

APRIL, 1941.

EXTRACTS FROM THE "LONDON GAZETTE."

Feb. 21.—Capt. (temp. Maj.) W. A. Robinson, M.D. (50009), to be Maj. *Feb. 11, 1941.*

Short Service Commissions.—The appt. of Lt. V. J. Keating, M.B. (85434), is ante-dated to *Feb. 1, 1938*, under the provs. of Art. 39, Royal Warrant for Pay and Promotion, 1940, but not to carry pay and allces. prior to *Feb. 1, 1939.*

Lt. V. J. Keating, M.B. (85434), to be Capt. *Feb. 1, 1940*, with seniority *Feb. 1, 1939.* (Substituted for the notfn. in the *Gazettes* of *Feb. 14, 1939*, and *Feb. 20, 1940.*)

Lt. (on prob.) C. D. Cruikshank (144552), is confirmed in his rank. *Nov. 18, 1940.*

The undermentioned, at their own request, revert to the rank stated whilst empld. during the present emergency :—

As Col. :—

Maj.-Gen. H. H. A. Emerson, C.B., D.S.O., M.B. (10584), ret. (late R.A.M.C.). *Jan. 29, 1941.*

As Maj. :—

Lt.-Col. J. B. Hanafin, C.I.E., F.R.C.S., (11028), ret. Ind. Medical Serv. *Jan. 25, 1941.*

Feb. 25.—*Emergency Commission.*—Lt. W. Allan, M.B. (106783), resigns his commn. *Dec. 30, 1940.*

The undermentioned Lt.-Cols., at their own request, revert to the rank of Maj. whilst employed during the present emergency :—

W. J. E. Bell, D.S.O., M.B. (4714), ret. pay (R.A.M.C.). *Jan. 27, 1941.*

Feb. 28.—Maj.-Gen. F. D. G. Howell, C.B., D.S.O., M.C., K.H.S. (8026), (late R.A.M.C.), retires on ret. pay. *Mar. 1, 1941.*

Col. J. S. McCombe, D.S.O., M.B. (4328) (late R.A.M.C.), retires *Mar. 1, 1941*, and remains empld.

Col. (temp. Brig.) J. A. Manifold, D.S.O., M.B. (9044) (late R.A.M.C.), to be Maj.-Gen. *Mar. 1, 1941.*

The undermentioned Lt.-Cols., from R.A.M.C., to be Cols. *Mar. 1, 1941 :—*

W. K. Morrison, D.S.O., M.B., V.H.S. (8126), with seniority *Jan. 1, 1938.*

E. Percival, D.S.O., M.C., M.B. (8128), with seniority *Aug. 1, 1938.*

Maj. (actg. Lt.-Col.) P. J. S. O'Grady, M.B., retires and remains empld. *Mar. 1, 1941.*

The undermentioned Majs. (temp. Lt.-Cols.) to be Lt.-Cols. *Mar. 1, 1941 :—*

G. W. Rose, M.B. (5816).

J. T. McConkey (15652).

Short Service Commission.—Lt. (on prob.) J. P. Crawford (154902) is confirmed in his rank. *Feb. 1, 1941.*

March 7.—Col. S. W. Kyle, M.B. (late R.A.M.C.) (5068), retires, and remains empld. *Mar. 8, 1941.*

Col. (temp. Brig.) J. A. Manifold, D.S.O., M.B. (9044) (late R.A.M.C.), to be a Dep. Dir. of Med Servs., and is granted the actg. rank of Maj.-Gen. *Feb. 15, 1941.*

March 14.—Lt.-Col. R. F. Walker, M.C., M.B. (22118), is restd. to estab. *Dec. 21, 1940.*

Maj. (actg. Lt.-Col.) M. C. Paterson, M.C., M.B. (10314), is secd. *Jan. 7, 1941.*

Capt. R. E. Waterston, M.B. (68582), a Short Serv. Off., is apptd. to a perm. commn. *Feb. 1, 1941*, retaining his present seniority.

Short Service Commission.—The notfn. regarding Lt. D. A. Bird (99103), in the *Gazette* of *Oct. 18, 1940*, is cancelled.

Regular Army Reserve of Officers.

Feb. 14.—Capt. F. K. Tomlinson, M.B. (14383), to be Bt. Maj. *Sept. 2, 1939*, under the provs. of Art. 168, Royal Warrant for Pay and Promotion 1940.

Feb. 25.—Col J. P. Lynch (10557) (late R.A.M.C.), having attained the age limit of liability to recall, ceases to belong to the Res. of Off. *Jan. 26, 1941.*

Capt. (temp. Maj.) D. J. Batterham, M.B., F.R.C.S. (9633), to be Bt. Maj. *Sept. 1, 1939*, under the provs. of Art. 168, Royal Warrant for Pay and Promotion, 1940.



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Feb. 28.—The undermentioned, having attained the age limit of liability to recall, ceases to belong to the Res. of Off. :—

Col. G. de la Cour, *O.B.E.*, M.B. (10743). Nov. 5, 1940.

Capt. (temp. Maj.) (actg. Lt.-Col.) E. G. H. Cowen, M.D., M.R.C.P. (51530), to be Bt. Maj. Mar. 1, 1941, under the provs. of Art. 168, Royal Warrant for Pay and Promotion, 1940.

March 4.—The undermentioned Capts. to be Bt. Majs. Mar. 4, 1941, under the provs. of Art. 168, Royal Warrant for Pay and Promotion, 1940 :—

G. Fleming, M.B. (15762).

H. G. Dresing, M.C. (1254).

March 7.—Capt. (temp. Maj.) G. H. Wood (14931) to be Bt. Maj. Mar. 4, 1941, under the provs. of Art. 168, Royal Warrant for Pay and Promotion, 1940.

THE ARMY DENTAL CORPS.

Feb. 21.—The undermentioned Capts. to be Majs. :—

A. N. Moon (40175). Jan. 20, 1941.

F. J. McCarthy, B.D.S. (49584). Jan. 28, 1941.

Regular Army Reserve of Officers.

Feb. 21.—Capt. E. Smith (24788) to be Bt. Maj. Feb. 11, 1941.

QUEEN ALEXANDRA'S IMPERIAL MILITARY NURSING SERVICE.

Feb. 21.—The undermentioned Staff Nurses to be Sisters :—

Miss M. J. Verity. Dec. 20, 1940.

Miss M. Downing. Dec. 27, 1940.

Provl. Staff Nurse Miss D. A. Gabbett terminates her appt. Feb. 1, 1941.

Feb. 25.—The undermentioned Staff Nurses to be Sisters :—

Miss M. Moreton. Jan. 2, 1941.

Miss. F. J. Parry. Jan. 10, 1941.

Miss D. M. Baker. Jan. 12, 1941.

March 7.—The undermentioned Sisters resign their appts. :—

Miss M. G. L. Cuming. Dec. 6, 1940.

Miss J. N. S. Cambell. Dec. 17, 1940.

Miss L. M. Thorpe. Feb. 23, 1941.

Miss J. H. F. D. Holland. Mar. 3, 1941.

Mar. 11.—Sister Miss J. C. J. Keir, resigns her appt. Jan. 10, 1941.

Mar. 14.—The undermentioned Staff Nurses to be Sisters :—

Miss W. D. Lindsay-White. Jan. 10, 1941.

Miss F. L. M. Millington. Jan. 22, 1941.

Miss M. M. Baldwin. Feb. 1, 1941.

Miss I. D. Hearn. Feb. 1, 1941.

Miss E. F. Shine. Feb. 1, 1941.

AWARDS.

Mar. 7.—The KING has been graciously pleased to approve of the undermentioned awards in recognition of distinguished services in the field :—

The Military Cross.

Lieutenant William Sillar, M.B. (110691).

March 7.—The KING has been graciously pleased to approve that the following be

mentioned for distinguished services in the field :—

No. 7367580 Pte. W. Cassidy.

March 11.—The KING has been graciously pleased to approve that the following be mentioned for gallantry during enemy action :—

No. 7359379 Pte. E. R. B. Maunsell.

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To them, through Assistant Directors of Medical and Dental Services, we would address a special appeal.

It has also been suggested that many units would be glad to follow the scheme which some have already begun and, under the scheme, all those who are willing to help, subscribe a small agreed sum each week; when a sufficient amount has been collected, it is sent to swell the funds of the Guild.

To the knitters we owe much for all their devoted labours and we would ask them not to relax their efforts during the coming summer months, since good stocks of woollen comforts will be required in readiness for next winter.

All subscriptions and offers of assistance from the Royal Army Medical Corps will be most gratefully received and acknowledged by Lady MacArthur, 48, Priory Road, Chiswick, W.4; or, from The Army Dental Corps, by Mrs. Clewer, Milton Hall Hotel, Montpelier Road, Brighton 1, and, on request, they will gladly supply wool to those wishing to knit.

Cheques and postal orders should kindly be crossed and made payable to "R.A.M.C. and A.D. Corps Comforts Guild."

DEATHS.

JAMESON.—At Malo-les-Bains, France, in the summer of 1940, Captain J. A. R. Jameson, The Army Dental Corps. Captain Jameson's name was previously included among those reported as missing at the time of the evacuation from Dunkirk.

Captain Jameson, who was born on May 9, 1913, at Gosforth, was educated at Giggleswick and at the University of Durham. He had been a member both of the Giggleswick School O.T.C. and the University of Durham O.T.C. and, having qualified as B.D.S. Durham, was appointed to a short-service commission, as a Lieutenant, in The Army Dental Corps on October 1, 1937. A year later he was promoted to the rank of Captain and served at Woolwich, Lichfield and Beachley. He was among those holding mobilization appointments and, on the outbreak of war, joined for duty as Dental Officer, No. 11 Field Ambulance, R.A.M.C., shortly afterwards embarking for France. No details are yet available, but it is understood that Captain Jameson became separated from his unit during the withdrawal from Dunkirk and was killed as a result of enemy action.

A correspondent writes :—

"Jameson was a young officer of the best type who, in his brief service, had indeed made his mark and was universally regarded as one who would have had an outstanding career in the Corps.

"His keenness, both professional and military, was evident from the start and he passed his preliminary course of instruction with the greatest distinction.

"Tragic as the result has been, it was in consequence of his ability that he was selected as one of those who had the honour of being among the first to embark for service

with the British Expeditionary Force in France.

"There he worked with his customary enthusiasm and the Adjutant of his unit has told us how popular he was with all their officers and men, cheerfully undertaking many duties apart from those which fell to his lot as their dental officer and entering fully into the work and comradeship of the unit.

"He died, as he had lived, in the service of his King and Country and his name will not be forgotten by those of us who knew him as a comrade whose duty was gallantly done and whose service was an inspiration.

"All in the Corps would, I know, wish to offer their deepest sympathy in the great loss which his family has sustained."

BOURKE.—In January, 1941, drowned by enemy action, Major John Francis Bourke, M.C. Born February 23, 1887, Major Bourke took the L.R.C.P., L.R.C.S. Edinburgh, and the L.R.F.P.S. Glasgow, in 1913. Commissioned in the 4th Battn. Cameronians (Scottish Rifles) November 21, 1907, he was mobilized August 5, 1914, and promoted Captain September 5, 1914. He took a temporary commission as Captain R.A.M.C. August 22, 1915, the commission being made permanent January 1, 1917. He was promoted Major August 22, 1927, and retired on account of ill-health November 6, 1940. After retirement he took up a ship's surgeoncy. During the war of 1914-1918 he served in France, Macedonia and Russia, and was wounded, being awarded the M.C., 1914-1915 Star, British War and Victory Medals. He was mentioned in despatches *London Gazette* December 6, 1916. He also served on the North-West Frontier of India 1930-1931, receiving the Medal with Clasp.

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- (6) Present a thesis (or published work in lieu of a thesis) concerned with some aspect of their radiological subject.

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There is a preliminary Examination at Candidates' own schools May 23rd, 1941. (Boys taking Scholarship Examination elsewhere during that week are excused it). Final Examination (at Cheltenham if travelling conditions permit) June 3rd, 4th & 5th, 1941. For further particulars apply to the Bursar, Cheltenham College.

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BURNSIDE.—Colonel Eustace Augustus Burnside, late R.A.M.C., died in Paisley, February 17, 1941. He was born in Nassau, in the Bahamas, September 24, 1860, the eldest son of the late Sir Bruce Burnside, was educated at King's College, London, and took the M.R.C.S. and L.S.A. in 1886. Entering the Army as Surgeon in 1887, he became Lieutenant-Colonel in 1911, Colonel in 1915, and retired in 1917, but was re-employed till December 20, 1918. He served in the South African War of 1899–1902, when he took part in the actions at Elandslaagte, Rietfontein, and Lombard's Kop, and in the Defence of Ladysmith, also in the subsequent operations in Natal, the Orange River Colony and Transvaal, being awarded the Queen's Medal with four Clasps, and the King's Medal with two Clasps. In 1917 he was appointed a Knight of Grace of the Order of St. John of Jerusalem. He was brought to notice for valuable services rendered in connection with the Great War and received the British War Medal.

HASSARD.—Colonel Edward Moresby Hassard, late R.A.M.C., died in Hindhead on February 20, 1941. He was born in Hilsea, November 10, 1862, the youngest son of the late Major-General F. Hassard, C.B., R.E., and received his medical education at St. Bartholomew's Hospital, taking the M.R.C.S., L.R.C.P. in 1886. Entering the Army as surgeon in 1887, he became

Lieutenant-Colonel in 1911, Colonel in 1915, and retired in 1919. He served on the North-West Frontier of India in the Isazai Campaign of 1892; in West Africa in the Lagos Campaign of 1897–1898, when he was mentioned in despatches and received the African Medal with Clasp; in operations in Sierra Leone in 1898–1899 (Clasp); in the South African War of 1899–1902, in operations in the Transvaal, in the Orange River Colony, and in Cape Colony, being awarded the Queen's Medal with three Clasps and King's Medal with two Clasps. In the war of 1914–1918 he served in France and Belgium from November, 1914, till February, 1918, being awarded the Military Order of Avis (Commander), the 1914 Star, British War and Victory Medals.

HEALD.—At Aberdeen, on March 13, 1941, Captain H. Heald, the Army Dental Corps. Born at Preston, Lancs., on April 5, 1915, he qualified in 1936, obtaining the degree of Bachelor of Dental Surgery at the University of Liverpool. After holding the appointment of house surgeon at the Liverpool Dental Hospital he was appointed to an emergency commission as a Lieutenant in The Army Dental Corps on November 20, 1939. After service in the Scottish Command, he was posted to a Field Ambulance and was promoted to the War Substantive rank of Captain on November 20, 1940.

EDITORIAL NOTICES.

The Editor will be glad to receive original communications upon professional subjects, travel, and personal experiences, etc., which should be in duplicate if possible according to King's Regulations.

Correspondence on matters of interest to the Corps, and articles of a non-scientific character, may be accepted for publication under a nom-de-plume.

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No. 5.

May, 1941.

Vol. LXXVI.

Journal

OF

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Royal Army



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ISSUED

MONTHLY

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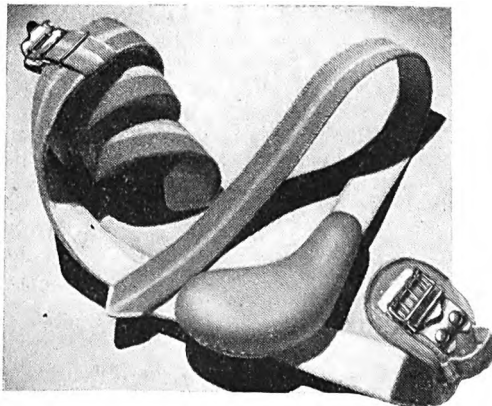
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Face first matter

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AN ANALYSIS OF 204 CASES OF CEREBROSPINAL FEVER AMONGST
THE BRITISH TROOPS OF THE BRITISH EXPEDITIONARY
FORCE IN FRANCE.

BY MAJOR-GENERAL ROBERT PRIEST, M.A., M.D., F.R.C.P., K.H.P.,
Consulting Physician, B.E.F.

THE 204 cases which form the subject of this report occurred amongst the troops serving with the British Expeditionary Force in France and were collected during the period from February, 1940, at a time when the incidence of cerebrospinal fever was rising rapidly week by week, up to June 14, 1940, after which date further observations became impossible. All these patients were seen by me at some period or other of their illness, some in the forward area units, a few in ambulance trains and the majority at the general hospitals at the evacuation bases. Also, some patients who had been transferred to the Convalescent Depot were seen by me again at varying periods after their discharge from hospital. The information for this report has been derived from the Field Medical Cards (Army Form W. 3118), the Medical Case Sheets (Army Form I. 1237), the Record Cards (Army Form I. 1220), Temperature Charts, the Infectious Disease Reports (Army Form A. 35) and from the histories I obtained from the patients themselves. Here I should like to express my thanks to all the medical officers who looked after these patients for their whole-hearted co-operation in supplying, under active service conditions, all the detail which is so essential for making a report of this nature. Before the collection of this series was commenced, it had been realized that the sooner patients were got under the influence of sulphapyridine the better the chance of complete

recovery. Delay in getting such patients under this influence was seen to be largely due to the very protean nature of the onset of the illness and in order to emphasize this point it was arranged that Major F. J. O'Meara, R.A.M.C., should give an address to all medical officers serving with units in the forward areas, to remind them of the very varied and sometimes very deceptive manner of onset of cerebrospinal fever. I feel sure that this measure played a large part in producing, under Field conditions, so low a mortality rate, a figure which compares very favourably with that of the population at home, where ideal conditions for transport and treatment existed.

The total of 204 consists of 171 bacteriologically proved cases and a group of 33 cases in which the symptoms, physical signs, clinical course and the general characteristics of the cerebrospinal fluid itself were typical of cerebrospinal fever but in which, for some reason or another, the causal organism was not seen in the stained film or failed to grow on the culture medium. Included in the clinical group are two cases in which the organism was recovered from the nasopharynx.

Intermingled with all these cases were 23 instances of other conditions resembling cerebrospinal fever in the early stages, such as meningism, most probably influenzal, early encephalitis lethargica, encephalitis of unknown cause but sometimes associated with rubella, lymphocytic meningitis, post-traumatic and concussive states and pneumococcal meningitis. It is of interest to mention that the patient suffering from the latter infection responded very well to sulphapyridine therapy and was eventually transferred to the United Kingdom.

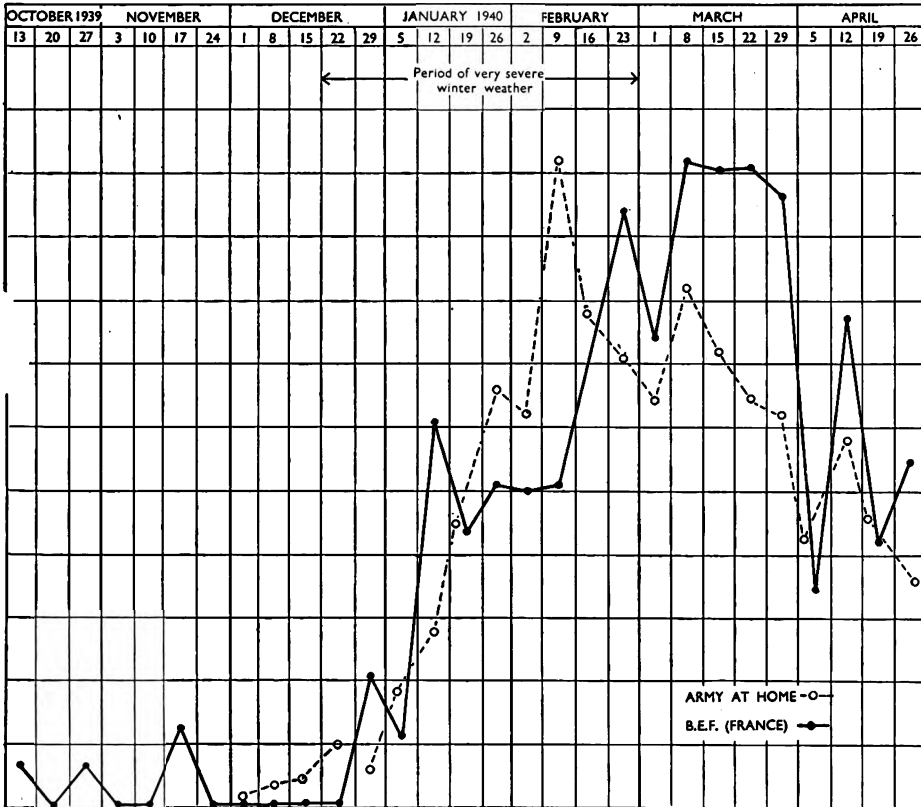
INCIDENCE.

At no time did the infection show any tendency to become epidemic and, as far as it could be ascertained, there was one instance only where a man sleeping in a bed next to an actual sufferer contracted the disease. On the contrary, its sporadicity was a particularly well-marked feature neither did any one unit appear to suffer more than another.

The chart, Table I, shows the curve of the weekly incidence of cerebrospinal fever in ratios per 1,000 from October 13, 1939, to April 26, 1940, in the Army at Home and in the Army in France. For security reasons the actual figures have to be omitted. The real cold weather set in in France suddenly during the week ending December 23, and lasted almost without a break until late in February; it proved itself to be a winter of exceptional severity with hard frost, snow and biting winds. It was to be expected that the advent of this real wintry weather would cause the troops to spend a greater proportion of their time indoors, leading to unavoidable overcrowding for unusually long periods during both daytime and the increasing hours of darkness. Add to this the impossibility of ensuring adequate ventilation in all buildings where troops gather during the hours of blackout,

and the well-recognized, ideal conditions are created for the spread of cerebro-spinal fever. This observation is made merely to confirm that in the mode of spread this disease behaved normally. It will be seen from the chart that the first high peak of incidence was reached during the week ending February 23, some fourteen days later than that of the Army at home. The highest incidence, however, was recorded in the week ending March 8, a figure which showed no great change up to March 29, after which it fell with

TABLE I



extraordinary rapidity following a period of very welcome betterment in the weather.

AGE-INCIDENCE.

No age appeared exempt but, as the troops in France were nearly all young men and formed what may be regarded as a more or less "selected" population, it is natural to expect that the greatest incidence would fall in the young age-group. The oldest patient was 45 and the youngest 18, and the average age 25.6. The ages of two men were not stated.

TABLE II.

Age	No.	Age	No.	Age	No.
18 ..	5	27 ..	6	36 ..	3
19 ..	11	28 ..	6	37 ..	6
20 ..	29	29 ..	19	38 ..	3
21 ..	27	30 ..	7	39 ..	1
22 ..	14	31 ..	4	40 ..	2
23 ..	17	32 ..	3	41 ..	1
24 ..	10	33 ..	2	42 ..	1
25 ..	7	34 ..	3	45 ..	1
26 ..	7	35 ..	7		

In the series there were three officers, two nursing sisters and the remainder other ranks.

ONSET.

It has already been mentioned how varied and deceptive the symptoms and physical signs may be in the very early stages of cerebrospinal fever and this was confirmed by a review of the diagnoses made by medical officers who saw the patients at an early stage of their illness. There were 73 "early diagnoses" collected from the field medical cards and these included cerebral conditions: meningitis 8, cerebrospinal meningitis 6, severe headache 4, meningismus 2, cerebral irritation 2, mental confusion 2, meningeal signs 1, mental irritability 1, injury to head 1, N.Y.D. hysteria 1, neurasthenia 1, subarachnoid hæmorrhage 1. Total 30, i.e. 41·1 per cent referable to some intracranial or cerebral abnormality. Influenza 13, acute gastritis 4, gastric influenza 1, enteritis 1, acute appendicitis 1, malaria 1, enteric fever 2, pyrexia of uncertain origin 4, acute rheumatism 2, muscular rheumatism 2, general pains 2, renal colic 1, subacute nephritis 1, broncho-pneumonia 1, bronchitis 1, sore throat 1, pharyngitis 1, erythema nodosum 1, dermatitis 1, epistaxis 1, acidosis 1.

Broadly speaking, cerebrospinal fever appeared in the B.E.F. in France in the following forms:

Severe fulminating type with rapid loss of consciousness and in which the meningeal signs occurred rather late. These patients appeared cyanosed, toxæmic and, if vomiting had been excessive, dehydrated; if the real nature of condition was not appreciated and the administration of sulphapyridine was delayed, a fatal termination was more than probable.

A form having an acute onset with signs of meningitis from the outset; fortunately this is the more usual form.

Those suffering from a chronic meningococcal bacteraemia for varying periods of time, days, weeks or months, with or without the presence of the causative organism in the post-nasal swab. This bacteraemia may cause a diversity of symptoms according to the region affected and may at any time terminate in the cerebrospinal form with either an acute or a slow insidious onset. In the latter event, the transition of the cerebrospinal fluid from a clear fluid containing a few lymphocytes to a turbid or purulent one with positive bacteriological findings has been observed.

Careful histories were taken from 107 patients and it was found that in 56 cases the onset was sudden, i.e. the time of onset could be very definitely fixed by the patients; in 42 instances the men said they had gone to bed feeling quite well but that they had awakened either during the night or at *reveille* complaining of one or more of the early symptoms of the disease. A good proportion of these very quickly passed into a state of unconsciousness, stupor or coma. The histories led one to conclude that 19 were examples of the chronic septicæmic type terminating in the cerebrospinal form of meningococcal infection. Twelve patients stated that their illness came on soon after some form of exercise or exertion, e.g. football 5, bathing 2, night exercises 2, route march 1, digging 1, strenuous work in the sun 1. Trauma to the head was an immediate antecedent in 4 cases.

TABLE III.

Symptom described as	A Was the first symptom in 12 cases	B Was an early symptom in —	C A symptom of established disease in —
Like the start of influenza	14 "	—	—
Off colour, queer, groggy, like T.A.B. inoculation (malaise)	8 "	—	—
Sore throat	2 "	—	—
Pain in chest	1 "	—	—
Fainting	1 "	—	—
Acute tenderness of scalp	1 "	—	—
Vomiting and diarrhoea	1 "	—	—
Shivering, cold sweats, shivers and sweats, like malaria (rigors)	42 "	47 cases	—
Cold in the head	8 "	1 "	—
Aches all over	9 "	23 "	—
General weakness	9 "	17 "	—
Stiffness of limbs	7 "	22 "	—
Joint pains	4 "	8 "	—
Bruised and tender muscles	3 "	1 "	—
Pains in back	3 "	4 "	—
Unsteady gait	2 "	5 "	—
Discharge from the eyes	1 "	1 "	—
Acute abdominal pain	1 "	4 "	—
Headache	53 "	142 "	149 cases
Vomiting	11 "	129 "	96 "
Pain or stiffness in neck	2 "	21 "	144 "
Excessive sweating	1 "	23 "	4 "
Dislike of light (photophobia)	—	5 "	22 "
Deafness	—	2 "	3 "
Blurred or double vision	—	7 "	4 "
Nose bleeding	—	3 "	1 "
Loss of smell	—	1 "	1 "

Table III gives a good impression of the symptomatic course as it occurred in the British Expeditionary Force. The information contained in column A represents the first symptom complained of by the patients themselves. Some of these symptoms may pass off quite soon, while others tend to persist and become the early symptoms described by medical officers in their notes as "condition on admission" in column B. The data for column C were extracted from all clinical material available and they showed that rigors, headache, vomiting and nuchal stiffness are the symptoms

which are most frequently seen in all stages of the disease. It should also be noted that certain symptoms tend to appear a little while after the onset and these in turn may either be transient, persistent or permanent defects, such as deafness, blurred vision or loss of smell.

Most commonly the headache was said to be behind the eyes, across the forehead, then spreading all over to reach the back of the head and down the neck. In other words, in the early stages the headache was nearly always frontal but in the well-established disease occipital. The headache has been described as terrible, pounding, throbbing, bursting, splitting, blinding, the worst headache ever, nothing relieved it, much worse on coughing or on movement. In one case headache was conspicuous by its absence throughout the illness.

Vomiting was sometimes troublesome and persistent. In some instances it was noted as projectile or cerebral in type, in others it simulated an acute gastritis when probably some article of food was held responsible for its cause. Vomiting was absent throughout in seventeen cases, while a few said they did not vomit until they started to take the sulphapyridine tablets. In a few cases sweating was a particularly striking feature and I remember one patient whom I saw in a Casualty Clearing Station whose face, head and forearms appeared to "steam." Closer inspection showed the skin to be covered with large beads of perspiration gradually coalescing and running down like raindrops on a window pane.

Pain and stiffness in the neck usually commenced a little while after the onset and, like the headache, showed a steady progressive increase in intensity to result in spasm sufficient to give well-marked retraction of the head.

Photophobia, too, while not a striking feature in the early stages was a fairly common symptom later on.

PHYSICAL SIGNS AND COMPLICATIONS.

On the whole, the abnormal physical signs tended to be of transient duration and had returned to normal by the time patients left the base hospitals. Unfortunately, owing to periodic emergency evacuations to the United Kingdom, it is impossible in this report to state the actual number of transient and permanent defects. Comparing the clinical course of the disease under treatment by sulphapyridine with that of the former method of repeated lumbar punctures combined with intrathecal injections of anti-meningococcal serum, it has been shown by several observers that there is a much smaller percentage of permanent loss of function after chemotherapy alone.

The mental disturbances reported were : drowsy 36, restless 26, delirious 21, unconscious 18, irritable 16, comatose 6, confused 6, dull 5, disorientated 5, stuporose 4, unable to sleep 4, noisy and violent 3, hallucinated 2.

Abnormal neurological signs discovered were : loss of sense of smell 1, permanent complete third nerve palsy 1, ptosis 2, nystagmus 4, strabismus 3,

weakness of external rectus of the eye 14, loss of corneal reflex 1, facial paresis 11, deafness 11, general rigidity 6, hemiplegia 1, localized anæsthesia 2, hyperæsthesia 2, spasticity of arm 1, neuralgic pains in arms 4, in chest 1, in loins 1, paresis of arms 2, of legs 1, wrist drop 1, foot drop 1, lower motor neurone involvement 3. Abnormalities in general appearance : head retraction 32, cyanosis 11, collapsed and dehydrated 2, marked rigidity 6, jaundiced 1, silvery tongue 2. Tendency to hæmorrhages : epistaxis 3, one of which was very troublesome, streaking of subconjunctival vessels running from corneal margin to inner or outer canthus of eye 10, frank subconjunctival hæmorrhage resembling that seen in whooping-cough 6, subcutaneous hæmorrhage 2, submucous hæmorrhage 1, total 22. Evidences of inflammation : sore throat 8, tonsillitis 1, conjunctivitis 1, arthritis involving the shoulder-joint 2, elbow 5, ankle 2, wrist 1 ; effusion into the joint was noticed in 2 of these. Pyelitis 1, cystitis secondary to catheterization 1, glycosuria occurring with unconsciousness in one patient suggested diabetic coma. Hiccough was particularly troublesome and persistent in 2 cases. Reflexes : These exhibited great complexity of abnormal combinations but the most noticeable feature was their changeability from day to day, some showing only a passing, others a more permanent disturbance. Pupils were noted to be normal in 145, dilated in 9, small in 4, sluggish to light in 12, inactive in 5 cases. Knee-jerks : Normal in 87, brisk in 53, sluggish in 20, absent in 11, unequal in 10 ; ankle-jerks : normal in 96, brisk in 49, sluggish in 17, absent in 9, unequal in 11 ; abdominal reflexes : normal in 79, brisk in 40, sluggish in 7, absent in 42, unequal in 19. Babinski's sign was present bilaterally in 13, unilaterally in 14 ; Kernig's sign reported present in 133 and Brudzinski's sign in 10 cases. Retention-incontinence of urine was present in 19.

Herpes labialis and zoster. These were evident in 75 patients ; their presence was not, as a rule, an early sign, but showed a tendency to appear at any time after thirty-six hours from the onset. They were seen on the nose and lips in 51 instances, over the area supplied by one or more of the three branches of the 5th cranial in 16, over the area of supply of the cervical plexus 6, musculo-spiral 1, and intercostal nerve 1. In one instance they appeared over the nape of the neck and were frankly pustular, in three instances they involved the face extensively.

An eruption on the skin was reported in 78 cases and was described as petechial in 35, macular in 19, hæmorrhagic in 5, erythematous in 5, purpuric in 4, and mixed in 10 (petechial and macular 5, hæmorrhagic and macular 2, petechial and hæmorrhagic 1, petechial and purpuric 1, petechial, macular and hæmorrhagic 1). The most frequent situation of the rash was upon the trunk and limbs as is seen from the records : very extensive 5, trunk 10, legs 8, arms 7, trunk and limbs 5, abdomen 4, abdomen and chest 2. It can well be realized that a patient in the early stages of cerebrospinal fever with headache, fever and a few macules on the abdomen or lower chest would suggest an initial diagnosis of enteric fever. The erythematous

patches varied in size, some large and indurated and resembled erythema nodosum very closely; others, described as macules, were in reality small, reddish, firm, slightly raised and occasionally tender spots, which when associated as these were, with fever of varying duration and with joint pains, formed a typical picture of chronic meningococcal septicæmia before it assumed the cerebrospinal form.

Cerebrospinal Fluid.—In all, 200 patients were lumbar punctured and, of these, one failed owing to extreme rigidity of the spine and one proved to be a dry tap. The large majority of the pathological reports were made by Major C. H. Stuart Harris, R.A.M.C., and Major Francis, R.A.M.C., each of whom was in charge of a mobile laboratory in the forward area.

Pressure was much increased in 47, increased 60, not increased in 10, not stated in 81. Character described as thick 3, turbid 172, hazy or opalescent 16, clear 2, not stated 5. Stained film reported as positive 156, negative 30, not stated 12. Culture was positive in 98 cases, negative 68 times, no record 32. Stained film and culture were both positive 126 times, stained film positive, culture negative 47,¹ stained film negative, culture positive 6, both stained film and culture negative 19.

The presence of a well-marked clot was reported in 18 instances and, when clot was reported the cerebrospinal fluid was either thick or turbid. In 2 of the clinical series the meningococcus was recovered from the nasopharyngeal swab. In 52 cases the meningococcus was found, by cultural methods, to belong to Group I, in 3 to Group III. Five were Group I by the precipitin test, 1 was Group I by the agglutination test, and 3 were reported to belong to both Groups I and II.

The nature of the cells was reported in 111 fluids, pus cells being present in 109 and lymphocytes in 2. As a reason for the presence of lymphocytes alone, it is probable that at first only very few organisms left the bloodstream to cause slight meningeal signs and some evidence of meningeal reaction in the cerebrospinal fluid. In case No. 122, on March 1, the cells in the fluid were lymphocytes with no organisms in the film, on March 11 the cells numbered 3,810 with 63 per cent polymorphs and 36 per cent lymphocytes. On March 13, organisms were seen in plenty in the film. The history, too, suggested that this was an example of a chronic meningococcal bacteriæmia leading gradually to an involvement of the cerebrospinal meninges, to which reference has already been made. The highest polymorph count in the fluid was 43,400 and the highest lymphocytic count was 384 per c.mm. There were no relapsing cases in the series.

TREATMENT.

At the commencement some patients were treated with sulphapyridine and anti-meningococcal serum, but experience later showed that patients suffering from the severe and fulminating forms of the disease responded so

¹ It should be noted that of these there were ten instances where sulphapyridine had been administered *before* the time of lumbar puncture.

rapidly and well to chemotherapy without serum, the latter was considered superfluous and its use abandoned. In fact, in some instances, the advent of serum sickness proved to be a "nuisance value" and a check in an otherwise uneventful convalescence. During the early prevalence of the disease no standard of treatment was laid down and many medical officers followed the dosage recommended by Banks (1940) or were guided by the effects of the drug on the general condition of the patient. In consequence a wide variation of dosage is found in the case notes. Later still, the general lines of treatment became more universally standardized after the arrival of the memoranda on cerebrospinal fever and sulphonamides from the War Office (A.M.D.7) which were published from time to time.

In this series of 204 cases all received sulphapyridine but unfortunately in 13 instances there was no record of the dosage. The maximum dosage was 81 grammes over ten days, minimum dosage 14.5 grammes over six days. The average dosage per patient was 34.4 grammes over a period of 7.9 days. Fifty-five patients received intramuscular injection of the soluble sulphapyridine. One of these injections caused induration at the site of injection which eventually disappeared; another produced a slough on the skin which remained somewhat refractory and slow to separate. Seven patients received the drug intravenously. Cyanosis was the most frequently observed feature during sulphapyridine administration but proved no obstacle to the continuance of the treatment. A sudden fall in the polymorphonuclears occurred in two instances and in one a very suspicious ulcer was noticed in the throat, but the much dreaded agranulocytosis did not make its appearance. Crystals of sulphapyridine appeared in the urine of three patients but these soon disappeared after the giving of copious drinks. A morbilliform rash was seen in three cases. The longest period between the onset of the illness and the first dose of sulphapyridine was nineteen days (an example of a pre-existing chronic septicæmic form) and the shortest was under twenty-four hours, the average being 2.3 days.

The drug tended to initiate vomiting in those who had not vomited earlier and to exaggerate the sickness in those who had.

EFFICACY OF CHEMOTHERAPY.

The rapid amelioration of the patients' general condition is now well known and is nothing short of miraculous. The comparative absence of any permanent disability is also another welcome feature of the introduction of sulphonamide derivatives. From a military or Service aspect these drugs have proved themselves of inestimable value in that, once a patient is well under the influence of the drug, he can be moved from a forward unit to one further back by ambulance car or train, without detriment to his ultimate recovery. The headache appeared to be exaggerated by the movement during such transfer, but, on recovery, the patients have said they could remember nothing of it. Similarly, cases can be transferred, if necessary,

to hospitals overseas at a much earlier period than was formerly possible. This was of enormous help to us at the times when available bed accommodation was short and emergency evacuations were ordered. Chemotherapy has also enabled us to send convalescent patients to a Convalescent Depot instead of sending them on sick leave. Unfortunately for this report many patients were sent to United Kingdom as emergency evacuation cases to continue their hospital convalescence. Of the 50 who were sent to the Convalescent Depot in France, 46 were examined by me at varying periods of their stay there. Three men said they had rather annoying headaches at times and one or two complained of some pain at the site of lumbar puncture. Aided, however, by the example of the remainder who made an obviously perfect recovery, these men also got quite well and went back to duty.

Sulphapyridine also proved of value in causing the disappearance of meningococci from the nasopharynx. The throat swabs of nearly 30 patients, previously meningococcus positive, became negative after a course of sulphapyridine in 1 gramme doses six-hourly for one day and eight-hourly for six days. Unfortunately, my records of these were lost and I have to quote from memory. In this respect sulphapyridine seemed more efficacious than sulphanilamide, but treatment of a larger series by alternative methods is necessary before definite judgment can be given. Gargles, spray, and applications of sulphapyridine to the nasopharynx were completely valueless.

Finally, the greatest boon is the effect of the sulphonamide derivatives on the mortality which before their discovery was anything up to 80 per cent.

MORTALITY.

In this series there were two deaths but neither of them was due directly to the effects of the meningococcus. One died six weeks after the onset from an ascending infection consequent upon necessary and repeated catheterization for retention of urine. The second died from bronchopneumonia and pericarditis with effusion and adhesions, not of meningococcal origin. There were some patients who were brought to a medical unit either dead or moribund or in too far an advanced state to be able to respond to chemotherapy. These are not included in this series. The mortality from this disease for the whole of the British Expeditionary Force for 1939 to April 22, 1940, is as under :—

For the first 98 cases mortality was 16·3 per cent (16 deaths).

For the next 92 cases mortality was 3·3 per cent (3 deaths).

For the last 31 cases mortality was 3·2 per cent (1 death).

The rather high percentage in the first 98 cases is accounted for by the fact that in the early period, when our own units were not completely opened, cerebrospinal fever patients were sent to the nearest French civil hospitals in many of which they received treatment by anti-meningococcal

serum and repeated lumbar puncture and not by chemotherapy; partly too, by the difficulty experienced and the delay in finding the location of the hospitals, the drivers of ambulance cars being quite unfamiliar with the localities and in part also by some delay in diagnosis for reasons already referred to. The very marked fall from 16·3 to 3·2 per cent is due, I am sure, to the earlier recognition of the disease and to the universal adoption of chemotherapy in our own units, which were by this time fully prepared to receive patients.

NOTES.

Special Types of Onset.—The onset may resemble that of subarachnoid hæmorrhage in those cases where sudden headache is associated with drowsiness or a semi-comatose state of varying and perhaps alternating intensity. Fortunately, both conditions lead to the performance of lumbar puncture when the correct diagnosis is arrived at. In the above series one patient was thought to be suffering from diabetic coma because of the presence of sugar in a catheter specimen of his urine. He was given insulin and glucose in suitable dosage but later some nuchal pain and rigidity suggested the advisability of lumbar puncture, when the true condition became evident. He did well with sulphapyridine alone. Ward and Driver (1940) reported a similar case. Glycosuria as an unusual sign of cerebrospinal fever is mentioned by Osler. Presumably it is due to some pressure or disturbance in the floor of the 4th ventricle for in Ward and Driver's case the 7th cranial nerve was affected while, in mine, the 8th was temporarily involved.

An early symptom may be intense hyperæsthesia of any part of the body, limb or extremity. Exquisite tenderness of the scalp was a marked feature in one of my patients.

The chronic septicæmic or pre-cerebrospinal form is very frequently diagnosed myalgia, muscular rheumatism or erythema nodosum. It has also been confused with trench fever because of pain in the lower limbs, the presence of pink spots and an irregular fever. This form may last for days, weeks, months, or years, and influenza, pyrexia of uncertain origin, enteric fever, malaria, latent tuberculosis are common diagnostic labels attached to the condition. The number of cases of the chronic septicæmic form I saw in France together with those I have seen during the past few months in the hospitals of the United Kingdom confirm the conclusion of Kennedy (1926) that the prevalence of meningococcal septicæmia is not yet well recognized in spite of the attention called to it in a more recent publication by Stott and Copeman (1940), who also note that this form of the disease becomes more common whenever meningococcal meningitis is present in a community. It is well known that the chronic septicæmic form may terminate at any time in the cerebrospinal form. It is quite conceivable that these chronic types may be "blood-carriers." Just as *B. coli* and *B. typhosus* may pass from blood to urine through inflamed or damaged renal tissue, so may meningococci leave the blood to pass into the secretion from

an inflamed nasopharynx. In this event, the disease may be spread by the "droplet" method.

Physical Signs.—Physical signs which I have not seen described hitherto are hæmorrhages beneath the conjunctivæ resembling that which is sometimes seen in whooping-cough; subcutaneous hæmorrhage with the formation of "blood-blisters"; submucous (palatal) hæmorrhage and engorgement or "streaking" of the small vessels running between the outer or inner canthus and the margin of the cornea, as is sometimes seen in typhus fever. Hæmorrhages of this kind are not mentioned by Osler; neither were they noted by medical officers in the field medical or record cards. As the hæmorrhages were so obvious at the time of my examination, they must be late signs. It is therefore probable that they are connected with the sulphapyridine and may be due perhaps to the deposition of crystals of the drug in the smaller vessels, as is seen in the hæmaturia associated with the presence of sulphapyridine crystals in the small vessels of the kidney. Williams and Brinton (1940) also reported ecchymoses, subconjunctival and submucous hæmorrhages in their series of 45 cases.

It is said that respirations are increased only when there is some pulmonary involvement. An increase of respirations to 40 or more per minute was observed in one of my series. Another patient, not included in the series, whom I saw with Colonel Stott, also exhibited this feature. There was no pulmonary complication discovered and the cause was considered to be central or medullary in origin.

Brudzinski's sign, which in my view is a most valuable sign of meningitis, was reported in 10 instances only. I am sure that if looked for, the sign would have been found in a far greater proportion of cases. Kernig's sign was, however, reported in 133 instances.

The type of fever is in no way characteristic; in the above series two patients remained afebrile throughout. Collapsed and dehydrated patients may show no fever until they have been resuscitated.

It was found in a certain number of convalescent patients who had received adequate treatment by sulphapyridine that meningococci could still be cultured from the nasopharyngeal swab. Were these meningococci the same organisms that had caused the attack? If so, they must have survived the action of the sulphapyridine. Or, were they superimpositions of fresh organisms upon a convalescent mucous membrane? Further research is necessary before these questions can be answered. Carriers, generally, cleared up rapidly upon giving sulphapyridine by mouth; local applications of the drug to the nasopharynx in the form of sprays, insufflations and gargles proved quite valueless.

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REORGANIZATION OF A FIELD AMBULANCE.

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FOLLOWING the return of the British Expeditionary Force from France and Flanders, one was immediately faced with the probability of encountering very different problems in active warfare in this country. To deal with these it was apparent that the normal organization of a Field Ambulance, with a Headquarters Company and two Bearer Companies, and moving as such, presented great difficulties in effecting that mobility which was so essential in the operations likely to be undertaken.

On consideration, too, of the recent fighting in France and Flanders, with its constant change and rapid movement, due of course to the advent and development of the Armoured Fighting Vehicle, it was felt that this would become a constant factor in all future warfare, and therefore any change in the composition of a Field Ambulance that would increase its mobility would be of inestimable value.

With the altered type of warfare and the emergencies likely to be encountered, whether isolated attacks by groups of A.F.V.s, possibly by attempted invasion from the sea at a large number of points simultaneously, or by parachute landings in force, or landings by troop carriers, it is obvious that to deal with the large number of eventualities that might arise in a Divisional, or even in a Brigade area, the orthodox arrangement of a Field Ambulance as laid down must be capable of being changed, and it is with this object in view that the following suggestions are made, both in the sub-division of the companies and in the method of loading. At the same time, the original composition as laid down can be adhered to if required.

The scheme, as formulated, has been based on the subdivision of the present Headquarters and two Bearer Companies, and the loading tables on the present scale of G.1098 Ordnance, and I.1248 Medical Equipment, with the two main essentials, mobility and speed, in view throughout. It is felt, however, that if any further alterations are to be made in the scale of equipment, certain articles could be left out with great advantage in mobility and without detracting in any way from the scope, protection, or usefulness of the Field Ambulance.

I propose to deal first with the suggested rearrangement of the personnel and, with this, the method of reloading, to show that by this means not only can a Field Ambulance deal with any emergency that may arise, necessitating the detachment of a small self-contained section, but also that all personnel can now be carried in the loaded vehicles of a Field Ambulance. It has always been a major difficulty in the movement of a Field Ambulance by road, that it is impossible to carry 50 to 60 men in the unit transport,

and this was never more apparent than during the recent operations in France and Flanders.

There may exist difficulties in the varying size of vehicles supplied to units but the proposed plan is based on the establishment laid down, of four 3-ton lorries and fifteen 30-cwt. lorries, and from the loading tables it will be seen that ample margin has been allowed to prevent overloading. (In the case of personnel, an allowance of $7\frac{1}{2}$ pounds per man has been given in excess of the normal scale). Weights of equipment have been taken in some cases from "Notes for Field Ambulance Commanders" and, where there has been any doubt, as well as in the case of all G.S. and Improvised Panniers and Cases, actual weighing has been carried out.

The proposed rearrangement of a Field Ambulance consists of splitting up each Bearer Company into a Company Headquarters Light Mobile Section and two other Light Mobile Sections, whilst the Headquarters Company is divided into two Sections, one Light, comparable to those of the Bearer Companies, and a Heavy Section which can still fulfil the original function of the Headquarters Company and form a Main Dressing Station. The splitting up of the Field Ambulance Headquarters Company has been done so that in an emergency a Field Ambulance Commander would have at hand a section which he could detach at a moment's notice, either as a replacement, a reinforcement, or to undertake some new unexpected operational role.

The splitting up of the Bearer Companies into three has been done almost equally, both in personnel and equipment, with the result that a Bearer Company can now function either in its entirety as before, or in two or three sections as required by the situation.

The strength of the Company Headquarters Light Mobile Section and of each of the other Company Light Mobile Sections is 1 officer and 21 other ranks. These are made up as follows :

Company Headquarters Light Mobile Section						Company Light Mobile Section	
1 Officer (Coy. Commander) ..	..	..	..	..	..	1 Officer	
1 S/Sjt. R.A.M.C. ..	..	..	..	..	..	1 Sjt. R.A.M.C.	
1 Cpl. Clerk R.A.M.C. ..	..	..	..	..	..	1 Cpl. R.A.M.C.	
16 Ptes R.A.M.C. ..	..	..	..	..	..	16 Ptes. R.A.M.C.	
3 Dvrs. R.A.S.C. (incl. Cpl.) ..	..	..	..	..	..	3 Dvrs. R.A.S.C.	

The Light Mobile Section of the Field Ambulance Headquarters Company varies very slightly, and has 1 Officer, 2 Serjeants, 18 Privates R.A.M.C., and 2 Drivers R.A.S.C. The distribution of these will be seen clearly set out in the personnel loading table (Appendix A).

The secret of the ability to carry all the personnel of a Field Ambulance lies in the method of distribution of the vehicles amongst the companies and their loading, to meet the requirements of the Light Mobile Sections and the Company Headquarters Light Mobile Section. It is done as follows.

Each Light Mobile Section is given two 30-cwt. lorries, whilst Company Headquarters Light Mobile Section has one 3-ton lorry. This leaves for the

Headquarters Company seven 30-cwt. lorries, and two 3-ton lorries. Of these, two 30-cwt. lorries go to the Headquarters Company Light Mobile Section, as in the case of the Bearer Companies, and the remainder are sufficient to meet the needs of the Headquarters Company Heavy Section. Of the remaining five 30-cwt. lorries, one is allotted solely to the Q.M. Stores, one to workshops and one to the cooks. It is proposed that normally all three water-trailers should be attached to 30-cwt. lorries of Headquarters Company Heavy Section, but it is felt that it would be advisable for one lorry of each light mobile section to be fitted so that a trailer could be attached in case of necessity.

To give a complete list of all the load tables would, I feel, make this article much too unwieldy but they are available if required. Appendix B. does, however, give a specimen of the loading of a Light Mobile Section and Appendix C. is designed to show the total weight tables of all the vehicles with the number of personnel carried in them, and that there has been no overloading. The question of reserve rations is solved by splitting them up between the sections and three days in amount can be carried quite easily.

In dealing with the loading of a Light Mobile Section, it may be pointed out that two different methods have been practised ; in the first, the equipment has been split equally between the two 30-cwt. lorries of the section and ten men carried in each ; in the other, practically all the equipment has been placed in one lorry, allowing for the carriage of only six men, while the other contains only anti-gas equipment, thereby enabling fourteen men to be transported. There are arguments for and against both methods. In the one case it is felt that all one's eggs are not in one basket, in the other, that the anti-gas equipment, which might be needed in a great hurry, is more easily accessible. By the latter means, too, a lorry is readily available for the collection or transport of lightly wounded casualties, should it prove necessary.

It is really essential to have in front of one the complete loading tables of all the vehicles to appreciate the varying allotment of the panniers, both Medical and G.S., and the methods devised to supplement them where necessary. In the Headquarters Company the Light Mobile Section is provided with panniers by improvisation and by the re-distribution of the G.S. panniers as a whole. For instance, G.S. pannier No. 8 has been split up largely between Nos. 2 and 7 ; Nos. 11 and 12 have been amalgamated. This provides for the following arrangement for panniers for the Light Mobile Section :—

- No. 11 becomes No. 1 (Nursing).
- No. 2 remains No. 2 (Cooking).
- No. 8 becomes No. 3 (Medical and Surgical Equipment.)

A and B Companies have necessarily had to split up the contents of their G. S. panniers to equip their Light Mobile Sections. As regards the Field Ambulance panniers their distribution can be done in various ways. They

can either be kept with the Company Headquarters section as a reserve and their place taken by improvised cases of equipment, or the F.A. pannier No. 2 can be given to one section, and the reserve dressing box and medical companion to the other.

The aim of my division and re-distribution has been to provide for the two main essentials of mobility and speed and, by the method suggested, it is contended that a company can be split rapidly and made use of in many different ways ; in fact one or more Light Mobile Sections can even be detached whilst on the line of march as a self-contained unit, ready to function at a moment's notice without any adjustment of equipment being necessary.

The varying tactical problems that might have to be met are innumerable ; for instance, one of the companies might be called upon to operate with a single battalion, or a mobile column on an extended front, and in this case the two Light Mobile Sections of a company could form Advanced Dressing Stations or Advanced Collecting Posts whilst the Company Headquarters could remain in reserve and reinforce either as necessary. In another case, the Company Headquarters Light Mobile Section and one Light Mobile Section might remain together, with Company Headquarters opened up, the Light Mobile Section with it remaining closed, ready to move forward in the event of any sudden advance. This method of leap-frogging has been practised frequently in Brigade and Divisional Exercises and has proved its worth in the ability of a Section or Sections to be kept open continuously whilst others are moving forward. Where you have possibly another situation, such as the defence of a number of widely separated A.P.s, perhaps 10 miles apart, and each the responsibility of an infantry battalion or similar unit, then the detachment of a Light Mobile Section solves a very difficult problem and ensures adequate medical help.

The advantage of this sub-division of a Field Ambulance, whether in the advance or withdrawal of a formation such as a Brigade Group, has certainly proved its value in practice and would, I feel, do so in actual war conditions. In an advance, a Light Mobile Section can move behind the leading battalion and, consisting of very few vehicles, can do so without hampering following troops, at the same time saving considerable time in the treatment and evacuation of casualties, when compared with the usual procedure of a Field Ambulance moving as a whole near the rear of the Brigade convoy. In a withdrawal it would enable a medical unit to remain with the rear guard throughout and, by leap-frogging, certain sections can be rested while the evacuation of all casualties can be assured, always a difficult procedure when a unit which has not complete mobility has to be withdrawn, at any rate in part, earlier in the proceedings than would be necessary under the suggested scheme.

There are endless possibilities with this arrangement and it does not preclude the companies working as a whole or split into two or three, whereas it makes for considerably increased mobility and speed in the evacuation of casualties.

There is one point that I should like to emphasize and that is that, to ensure smooth working, a great deal of practice is necessary. Each officer and N.C.O. should be trained to take the individual responsibility necessary for success. I have found that Field Ambulance exercises can now be made very much more interesting and tactical situations introduced more easily. The command of the Field Ambulance and the Companies is circulated amongst the officers and N.C.O.s. Others are utilized as umpires and all given training in responsibility and initiative.

Normally, each Light Mobile Section consists of two 30-cwt. lorries and, when available, an officer's 8-h.p. Austin car. The question of distribution of ambulance cars, of necessity, depends on the tactical situation, but on the line of march one ambulance car always travels with each Light Mobile Section in case it has to be detached at a moment's notice. In the event of operations a pool can be formed at the Field Ambulance Headquarters and the cars distributed as required.

Owing partly to the fact that, during the recent fighting, ambulance cars seemed to enjoy a priority as regards dive-bombing attacks from the air and machine gun fire from the ground and partly to the very wide area likely to be covered in the operations envisaged, it is felt that the normal establishment of ambulance cars in a Field Ambulance should be raised to 12. In the same way a larger number of motor cycles would be invaluable to ensure adequate intercommunication between the Light Mobile Sections and Field Ambulance Headquarters. Ten in all, in place of the present establishment of five, would be a convenient number. It is certainly imperative that there should be one per section and this would only leave Headquarters with its normal allotment of three.

It will be noticed in the personnel loading table that one motor cycle has been allotted to the Transport Officer. This would probably only be operative during an actual convoy drive or move of Field Ambulance Headquarters. On arrival this motor cycle would be returned to the Headquarters pool. It is essential, and is laid down, that there should be an officer mounted on a motor cycle during all moves in convoy. This also frees one two-seater car for the use of the liaison officer; in active operations the Dental Officer can be usefully employed for this duty.

There is one point which might be raised in discussing the allocation of one M.O. to each Light Mobile Section and that is that, in the event of a Main Dressing Station being required, there would be an insufficiency of medical officers. I think this is only a remote possibility. In this country the necessity for forming a Main Dressing Station will very rarely arise, owing to the large number of Hospitals, E.M.S., Military, and others, that are available. In other spheres it is unlikely that all seven Sections will be needed at one and the same time and it should be possible to utilize the medical officers of those Sections in reserve for this purpose.

These are suggestions that have been based on the necessity of providing medical aid in a large number of operational roles of varying types, likely

to be carried out by any mobile formation, and they have been practised in all kinds of exercises. It is certain that there must be very many improvements that can be made to this scheme but it has been put forward in the hope that it will form a basis for experiment and that suggestions will be forthcoming as a result. The writer would be extremely grateful for any new ideas and will willingly send a copy of the full loading tables to anyone that is interested.

SUMMARY.

(1) The experience of the present war to date, with its changed type of active operations, necessitates an alteration in the organization and loading of a Field Ambulance, to allow for increased speed and mobility.

(2) With the suggested alteration it is now possible to carry all the personnel of a Field Ambulance.

(3) With the proposed organization, a Field Ambulance is still capable of being used exactly as before but it can now, if required, be split up into seven Light Mobile Sections and one Heavy Section, capable of dealing with any emergency that may arise.

(4) If the establishment could be changed, an increase in the number of ambulance cars to twelve and motor cycles to ten would be of inestimable value. On the other hand, there are many articles both in the G. 1098 and I. 1248 equipment that could be dispensed with.

(5) The 3-ton lorries used in the above experiments were Thornycrofts, which have internal dimensions of 13 ft. 9 ins. by 6 ft. 9 ins., thus having a greater loading capacity than Bedford 3-ton lorries whose internal dimensions are 11 ft. by 6 ft. 3 ins.

APPENDIX A.

PERSONNEL LOADING LIST.

Headquarters Company

Humber 4-seater car, O.C...	..	..	1 Officer	..	1 R.A.S.C.	..	2 R.A.M.C.
One 2-seater car, 2nd i/c	..	..	1 Officer	..	1 R.A.S.C.		
One 2-seater car, Q.M.	..	..	1 Officer	..	1 R.A.S.C.		
One 2-seater car, L.O. (Dental Officer)	..	..	1 Officer	..	1 R.A.S.C.		

H.Q. COY. Light Mobile Section.

One 30-cwt. Lorry	..	..	1 Officer	..	1 R.A.S.C.	..	5 R.A.M.C.
One 30-cwt. Lorry	..	..	..	..	1 R.A.S.C.	..	15 R.A.M.C.

H.Q. COY. Heavy Section.

One 3-ton Lorry	..	..	..	..	1 R.A.S.C.	..	5 R.A.M.C.
One 3-ton Lorry	..	..	..	..	2 R.A.S.C.	..	7 R.A.M.C.
One 30-cwt. Lorry and Water Trailer	..	..	..	..	2 R.A.S.C.	..	4 R.A.M.C.
One 30-cwt. Lorry and Water Trailer	..	..	..	..	1 R.A.S.C.	..	4 R.A.M.C.
One 30-cwt. Lorry and Water Trailer	..	..	..	..	1 R.A.S.C.	..	5 R.A.M.C.
One 30-cwt. Lorry	..	..	..	..	1 R.A.S.C.	..	8 R.A.M.C.
One 30-cwt. Lorry (Workshops)	..	..	..	..	5 R.A.S.C.		
Eight Ambulance Cars	..	..	..	..	16 R.A.S.C.	..	8 R.A.M.C.

5 Officers .. 35 R.A.S.C. .. 63 R.A.M.C.

"A" and "B" COYS. (each) H.Q. Light Mobile Section.

Humber 4-seater car	1 Officer	..	1 R.A.S.C.	..	2 R.A.M.C.
One 3-Ton Lorry	..	..	..	..	..	2 R.A.S.C.	..	16 R.A.M.C.

Light Mobile Section.

One 2-seater car	..	..	..	1 Officer	..	1 R.A.S.C.		
One 30-cwt. Lorry	..	..	..	..	..	1 R.A.S.C.	..	9 R.A.M.C.
One 30-cwt. Lorry	..	..	..	..	..	1 R.A.S.C.	..	9 R.A.M.C.

Light Mobile Section.

One 30-cwt. Lorry	1 Officer	..	1 R.A.S.C.	..	9 R.A.M.C.
One 30-cwt. Lorry	1 R.A.S.C.	..	9 R.A.M.C.

3 Officers	..	8 R.A.S.C.	..	54 R.A.M.C.
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"B" COY. only

Motor Cycles	1 Officer	..	4 R.A.C.S.		
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GRAND TOTAL	12 Officers	..	55 R.A.S.C.	..	171 R.A.M.C.
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Of an establishment of 177 Other Ranks (R.A.M.C. and A.D. Corps) at least 6 Other Ranks would be left behind for Guard Duties, and in the event of an operational move these could all be accommodated on various lorries without overloading.

The establishment of a FIELD AMBULANCE is as follows :—

		OFFICERS	O.R.'s.
R.A.M.C.	..	10	176
A.D. Corps	..	1	1
R.A.S.C.	..	1	55
		<hr/> 12	<hr/> 232

In addition there is :—

R.A.M.C. (1st line reinforcements)		7
	<hr/> 12	<hr/> 239

APPENDIX B.

LOADING TABLE OF A LIGHT MOBILE SECTION.

Lorry No. 1. 30-cwt. Stores Lorry.

Designation	Number	Weight
Haversacks, surgical	2	13
Haversacks, shell dressing	4	12
Bottles, water, medical, filled	5	50
Splints, Thomas, complete	3	15
Splinting, Cramers, lengths	5	3
Stretchers	10	255
Pillows, Stretcher	10	22½
Slings, S.B.	20	10
Bars, suspension	4	14
Blankets	20	90
Pyjamas, suits	10	22
Cases, Wooden, No. 2	1	40
Panniers, G.S. No. 4	1	90
Kerosene in containers, galls.	2½	45
Lamps, Hurricane, filled	1	4
Trestles, prs.	1	24½
Shovels, G.S.	1	3½
Pannier, Medical Comforts	1	90
Sheets, Ground	20	64
Stools, Camp	1	11
Tables, Camp, Mk. III	1	20
Covers, canvas	2	28

Reorganization of a Field Ambulance

Designation	Number	Weight
Containers, 6 galls.	2	27
Insulators	2	150
Containers, portable, 1 gall.	1	12
Containers, water, 2 gall. filled	3	72
Kettles, Camp, 12 qt.	2	20
Pans, frying	2	12
Stands, cooking	2	30
Plates, baffle	2	8
Stoves, portable	1	100
Containers, tin 2 gall. filled	1	24
Axes, hand	1	2
Axes, pick	1	7½
Boxes, stationery, small	1	80
Poles, flag, directing	1	1½
Saucepans, Nests of 5	1	10
Petrol, Reserve, 8 galls.	—	64
One day's fresh rations for 22 men	—	85½
Personnel, in full marching order	6	1200
Medical Companion, improvised	—	13
Total Weight		(lb.) 2844½

Lorry No. 2. 30-cwt. Personnel Lorry.

Designation	Number	Weight
Cases, Wooden No. 1*	1	119
Bags, contaminated clothing	4	6
Capes, A.G.	27	54
Gloves, A.G. prs.	34	18½
Overboots A.G. prs.	6	48½
Jackets A.G.	3	1½
Trousers A.G.	3	1½
Gas, reserve, in bag	1	8½
Petrol, Reserve, 8 galls.	—	64
Personnel, in full marching order	14	2800
Total weight		(lb.) 3121½

* In this case, amongst other items, 2 days reserve rations for section would be carried.

APPENDIX C.

WEIGHTS CARRIED ON ALL LORRIES, COMPARED WITH FULL CARRYING CAPACITY.

Carrying capacity:—

3-ton Lorry	6720 lb.
30-cwt. Lorry	3360 lb.

HEADQUARTERS COMPANY.

Heavy Section.	Weight carried
Lorry No. 1. 3-ton 6 Men	5168 lb.
Lorry No. 2. 3-ton 9 Men	5095½ lb.
Lorry No. 3. 30-cwt. 6 Men	2899 lb.
Lorry No. 4. 30-cwt. 5 Men	2401 lb.
Lorry No. 5. 30-cwt. 6 Men	3264 lb.
Lorry No. 6. 30-cwt. 9 Men	2515 lb.
Lorry No. 7. 30-cwt. 5 Men Workshops, Tools, &c.	1000 lb.

Light Mobile Section.

Lorry No. 1. 30-cwt. 7 Men	3116½ lb.
Lorry No. 2. 30-cwt. 16 Men	3200 lb.

"A" COMPANY

Headquarters Light Mobile Section.

Lorry No. 1. 3-ton 18 Men	5956 lb.
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Light Mobile Section I.

								<i>Weight carried</i>
Lorry No. 1.	30-cwt.	10 Men	2953 $\frac{3}{4}$ lb.
Lorry No. 2.	30-cwt.	10 Men	2981 $\frac{1}{4}$ lb.

Light Mobile Section II.

Lorry No. 1.	30-cwt.	..	..	11 Men	..	..	..	3049 lb.
Lorry No. 2.	30-cwt.	..	..	10 Men	..	..	..	2953 $\frac{1}{4}$ lb.

*"B" COMPANY.**Headquarters Light Mobile Section.*

Lorry No. 1.	3-ton	18 Men	5668 lb.
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Light Mobile Section I.

Lorry No. 1.	30-cwt.	6 Men	2831 $\frac{3}{4}$ lb.
Lorry No. 2.	30-cwt.	14 Men	3121 $\frac{1}{2}$ lb.

Light Mobile Section II.

Lorry No. 1.	30-cwt.	..	..	6 Men	..	..	..	2837 $\frac{7}{8}$ lb.
Lorry No. 2.	30-cwt.	..	..	15 Men	..	..	..	3321 $\frac{1}{2}$ lb.

PHTHISIS FOLLOWING PLEURISY.

BY CAPTAIN W. LAURIE, I.M.S.

THIS paper records the results found in a six-months period of observation of fifty-eight soldiers of the Indian Army who developed pleurisy while serving in the Razmak Camp, Waziristan.

Primary idiopathic pleurisy is now regarded as a manifestation of latent tuberculosis. Due probably to the differences in the lengths of time that the patients have been observed, there is some difference of opinion among workers as to the probable numbers of pleurisies caused by latent tuberculosis; among those who regard tuberculosis as the cause in the large majority of cases of pleurisy are Boyd (1935), Maxwell (1938), McCrae (1932), and Tidy (1934), all of whom also agree that pleurisy with effusion should be regarded as being particularly suggestive of underlying tuberculosis. Ward (1940) points out the stress laid upon any history of pleurisy in the assessment of fitness of British Army recruits.

There is also general agreement that the usual methods of clinical examination of the chest are of little use in the detection of early lung tuberculosis; this is well brought out in the article by Cooper (1940) on the results of radiological examination of the chests of twenty-two thousand men of the Sixth Division, Second Australian Imperial Force. Similarly, microscopical examination of sputum may give a diagnosis of phthisis before the clinical signs are definite.

In view of the above, in February, 1940, the Deputy Director of Medical Services, Northern Command, India, issued instructions that all cases of pleurisy occurring in this Command should be given six months off duty, during which time a detailed observation would be made to record their progress with treatment and rest. This scheme was brought into operation in Razmak Camp, Waziristan, in March, 1940, and this article is a summary of the results obtained in individuals who were under my care.

LIVING CONDITIONS OF THE PATIENTS.

For reasons of security it is not possible to give certain details of the camp but it may be said that Razmak is a permanent military camp in Waziristan, North-West Frontier, India, and is situated near the borders of Afghanistan at a height of 6,500 feet, in the bleak inhospitable Sulaiman Hills. In this camp the demands upon the soldiers are much more severe than is the case in the Plain Stations of India, both from the point of view of the climate to which the men are exposed and of the duties which they are called upon to perform. From the middle of November to the middle of March the climatic conditions are severe, with the minimum temperature

near or below freezing point, with frequent heavy rainstorms and snowstorms and with a bitterly cold wind. The local political situation is such that certain routine duties must be carried out regardless of the weather, and this often necessitates the soldiers lying for several hours in exposed positions in the hills without any protection from the elements. In the day's work, also, unusually heavy demands are made upon the lungs since the soldier has to scramble up and down hills as much as two thousand feet above the level of the camp itself.

Another factor to be taken into account is that of overcrowding; in this camp the garrison numbers some thousands of whom the majority are accommodated in one-storied barracks and all housed within an area of not more than two square miles. It is not possible to enforce the Army standard of three feet of space between adjacent beds, but the barrack rooms are so arranged that the head of one bed alternates with the foot of the next, so that the danger of droplet infection may be reduced as much as possible.

This danger of rapid spread of infectious disease among individuals living together in barracks is stressed by Radmilo (1939).

The conditions mentioned above are such that the results of this investigation may differ from those obtained in a similar investigation of patients living a less exposed and less strenuous life.

METHODS OF INVESTIGATION.

All of the fifty-eight individuals examined in this scheme were soldiers of the Indian Army. Only one of the patients had been recruited after the outbreak of the present war. The other fifty-seven had all been enrolled and had seen service in the Regular Indian Army before the beginning of the war and were all professional soldiers. The results of this investigation, therefore, may be taken as applicable to the peace-time Indian Army and should not be regarded as a special problem arising from any temporary lowering of recruiting standards. The different communities recruited for the Indian Army—Gurkha, Hindu, Mussulman and Sikh—were represented among the fifty-eight patients in a proportion in keeping with the numbers of each community in the camp and the figures from the different branches of the Service, such as Artillery, Infantry, etc., showed no significant variation. These points are mentioned to show that the results obtained are not due to the unfitness of men recruited for any special branch of the Army, nor are the results due to the unfitness for service of any one community, religious or social.

The treatment of the patient during his attack of pleurisy and the six-months follow-up after discharge from hospital were carried out in my wards in the Indian section of the Combined Military Hospital, Razmak. It was thus possible to standardize the treatment and the investigation.

Of the fifty-eight patients forty-eight suffered from primary idiopathic fibrinous pleurisy and the remaining ten suffered from pleurisy with effusion. In those patients suffering from fibrinous pleurisy the treatment while they

were in hospital was on general lines much like that of an early tuberculosis. The sputum of each patient was examined three times weekly in the clinical side room of the wards, and was sent once weekly for examination to the Waziristan District Laboratory. The patient's weight was recorded weekly. Due to a temporary shortage of X-ray films it was not found possible to X-ray more than sixteen of the patients during the stay in hospital. Eighteen more were X-rayed while on the follow-up course. All patients were kept in hospital until the disappearance of local signs and symptoms, until an increase had been recorded in the body-weight, and, in the case of those patients who had been admitted with low blood-pressure, the blood-pressure had risen to at least 110/75, and all secondary conditions such as anæmia had disappeared and until, in the exercise-tolerance test, the pulse-rate after exercise returned within one minute to a figure not more than ten beats per minute above the pulse-rate at rest. The exercise-tolerance test which we evolved was very similar to that recommended by the Horder Committee (1940). The sedimentation rate was also used in doubtful cases before they were discharged.

The average length of the stay in hospital of patients with fibrinous pleurisy was thirty-one days. The average number of sputum examinations per patient was sixteen, of which twelve were carried out in the clinical side room and the remaining four in the Waziristan District Laboratory.

Patients suffering from pleurisy with effusion were treated in much the same fashion as the individuals with fibrinous pleurisy except that they were retained in hospital until the effusion had absorbed or had been completely removed and had been replaced by air. All samples of fluid removed from the chest were sent to the District Laboratory for microscopical examination and for guinea-pig inoculation. The chests of five of these patients were X-rayed while they were in hospital and the remaining five were X-rayed during the period of observation. With this type of patient, the tests of fitness for discharge from hospital were exactly as used for the patients with fibrinous pleurisy.

The average stay in hospital of this type of patient was one hundred and four days with an average of forty clinical side room and sixteen District Laboratory examinations of sputum.

At the time of discharge of the patient from hospital, a follow-up form was made out for him, giving a synopsis of the history and the course of the disease. On this form were also entered the clinical findings, the weight, and the result of the sputum examination found at the routine weekly inspection of the patient. This routine weekly examination during the six months of observation took the form of a clinical examination of the chest, recording of the patient's weight, an exercise-tolerance test, and the recording of the blood-pressure. The patient was given, at the close of the examination, a sterile screw-capped glass container for sputum; he took this container away with him, and reported next morning with the bottle containing a twenty-four hour sample of sputum which was then sent

to the District Laboratory for examination. In some of the cases it was found necessary to X-ray the chest during this period of observation.

Patients were readmitted to hospital for conditions such as recurrence of local signs or symptoms and if, for three consecutive weeks, the weight had shown a decrease.

Our first intention had been to give the patient six months' rest after the attack of pleurisy but this arrangement was not carried out. The principle of the six months' rest period was that the patient, presumably suffering from latent tuberculosis, should not be exposed to severe exertion and climatic conditions before he had time to recover sufficiently to escape breaking down and becoming a frank phthisis. A principle of even greater importance to the Army, however, was the prevention of infection of healthy individuals by a patient with "open" tuberculosis. The best way of combining these two principles, namely the protection of the patient and the protection of the healthy contact, was by the introduction of a graduated scale of exercises for the convalescent patient to enable him to return to duty at the end of the convalescent period and at the same time to assist me to detect, while they were still under my control, those men for whom further service in the Army would have been harmful both to themselves and to the community. The exercises began in the first month with the patient being allowed to attend one lecture daily, provided that this lecture were in the open air, and by steady increments of duty these exercises had attained a standard approximating to about 80 per cent of normal duty by the end of the sixth month of the observation period, at which time the patient was sent back to full duty if no contra-indication had been found.

RESULTS OF INVESTIGATION.

Of the forty-eight individuals with fibrinous pleurisy, eleven (i.e. 23·8 per cent) developed "open" phthisis before the end of the period of observation. Three of these eleven patients had not been X-rayed and, of the seven who had been examined by X-rays, three showed X-ray evidence of phthisis. A note is given below on the reason for the small number of patients found positive by X-ray examination.

All of the eleven phthisis patients were detected as having tuberculosis on the results of the routine weekly examination of the sputum in the Waziristan District Laboratory.

On the average, the period at which these men broke down and began to show *Myco. tuberculosis* in the sputum was on the fifteenth week of the convalescent period.

A most disturbing feature of the finding of these patients with tuberculous lungs was that, at the time the microscopical diagnosis was made, eight of the eleven patients so diagnosed would have been passed as fit at any routine medical examination. They looked fit, they showed no clinical sign in the chest, their weights were not falling, and they themselves felt quite fit. It was with the greatest difficulty that these eight

apparently fit men could be persuaded that they were suffering from tuberculosis.

Another disturbing point was that, in four of these apparently fit patients, the diagnosis was made very late in the convalescent period. One patient was diagnosed in the twenty-fourth week, one in the twenty-fifth week, and two in the twenty-sixth week, just previous to the time when they would have been discharged as fit for full duty. This type of patient is the real danger to the Army.

The finding of *Myco. tuberculosis* in the sputum of the three remaining individuals was not unexpected and occurred coincident with the finding of X-ray signs of phthisis and with the appearance in the chest of clinical signs suggestive of phthisis. They broke down early in the convalescent period, one breaking down in the fourth week and two in the sixth week. (See Case Histories, Nos. 5, 9 and 10 below.)

Before the end of the observation period on the ten patients suffering from serous pleurisy, six (i.e. 60 per cent) of the ten were found to have *Myco. tuberculosis* in specimens of sputum sent for examination to the District Laboratory. All of these patients had been X-rayed but only in two was the diagnosis of lung tuberculosis supported by the reports on the chest radiograms. As in the case of the eleven fibrinous pleurisies, the diagnosis was made by the District Laboratory staff from the routine weekly samples of sputum.

The average time of breaking down of the six patients was in the eleventh week. Other facts which should be borne in mind in assessing the prognosis of these pleurisies with effusion are that the ten individuals with serous pleurisy were the least unfit of a series of sixteen patients, the other six having been discharged from the Army as being obviously unfit for further service. There was no such choosing of patients in the series of fibrinous pleurisies. These ten individuals had spent very much longer in hospital than had the patients suffering from fibrinous pleurisy, the average times being 104 days and 31 days respectively. At the end of the six months' convalescence two of the patients with effusion had been fully twelve months off duty. These ten patients were not given steady increments of duty each month as were the patients with fibrinous pleurisy. In fact, at the end of the six months of observation, the majority of these patients with pleurisy and effusion had reached a stage of exercises which the fibrinous type of patient was given at the end of the first month of convalescence. It was necessary, therefore, to extend the period of convalescence to nine months for the patients of this type.

In two of the patients with effusion the diagnosis of phthisis was unexpected, as the progress had been satisfactory, but the remaining four individuals had been unsatisfactory throughout and had been expected to break down.

The system, on the finding of *Myco. tuberculosis* in a sputum, was that the patient was readmitted to hospital and segregated until the diagnosis

had been confirmed by the finding of the causative organism in at least three separate twenty-four hour specimens of sputum ; no man was diagnosed on one sputum examination. These three samples of sputum for confirmation were taken with precautions which ruled out any possibility of substitution of a sputum known to contain *Myco. tuberculosis*. Further precautions were also taken in the District Laboratory where each specimen of sputum was examined and reported on independently by the Deputy Assistant Director of Pathology of the District and by one of his staff. A further precaution was that many of these sputa were sent to the Laboratory under assumed names. These precautions were carried out to protect the patient against a casual diagnosis and not because we feared any attempt at malingering. This question of malingering did not arise because, with one exception, our patients were professional soldiers, making the Army their career, and to them the diagnosis of tuberculosis was a severe blow. Some of the patients were looking forward to gratuities, some to pensions and some to promotion. An example of the patients' reactions to the diagnosis is the case of a havildar (serjeant) who felt and looked fit and when told that he was suffering from phthisis said that his sputum must have been faked and insisted on taking other specimens of sputum to the District Laboratory himself and waiting there until they had been examined.

All specimens of fluid removed from the chests of the patients with effusion were submitted for investigation and all proved sterile on direct microscopic examination and on guinea-pig inoculation.

Fourteen of the seventeen patients diagnosed as tuberculosis had radiograms taken of their chests ; in five patients the diagnosis was confirmed. This small percentage of confirmation was probably due to the fact that screening of the chests was not possible. The District Radiologist is stationed seventy-two miles from Razmak and the only method open to us was to have the chests X-rayed by our technician and the films sent to the radiologist for opinion. I have discussed the matter with the radiologist who pointed out that, without screening of the patient, it is difficult to diagnose an early stage of phthisis from one X-ray film of the chest. Full radiological investigation would probably have allowed us to make a diagnosis of phthisis in some of the patients before the sputum became positive ; this would probably have been the case with the patients Nos. 5, 9 and 10 below.

Below is given in some detail the case histories of the seventeen patients who developed " open " phthisis during the period of observation.

CASE HISTORIES.

Fibrinous Pleurisy.

(1) Sikh Sepoy, aged 30, ten years' service.

Admitted to hospital with fibrinous pleurisy over the nipple area, left side of chest, of two days' duration ; the local signs and symptoms persisted for twenty days after the admission of the patient to hospital.

Weight on admission was 108 lb. (Height 5 ft. 6 in.)

Blood-pressure was 110/68.

X-ray examination of the chest was not carried out.

Poor exercise-tolerance.

Patient discharged after thirty-eight days in hospital, with weight 109 lb. and blood-pressure 120/80.

Except for the weight, which remained about 110 lb. throughout, the convalescence was satisfactory and the patient appeared to have completely recovered when, on the last week of his convalescence, and twenty-six weeks after discharge from hospital, he was found to have sputum containing *Myco. tuberculosis*.

(2) Sikh Sepoy, aged 23, five years' service.

Admitted to hospital with fibrinous pleurisy mid-axillary area, nipple level, left side chest, of twelve hours' duration. Local signs persisted for twenty-one days.

Weight on admission was 138 lb. with blood-pressure 110/70 and height 5 ft. 9 in.

X-ray examination of the chest was not carried out.

Exercise-tolerance was unsatisfactory.

Patient was discharged after thirty-five days in hospital with weight 142 lb. and blood-pressure 120/80.

Convalescence was satisfactory, with weight increasing until the sixth week of convalescence, when a recurrence of pleurisy was found in the part of the chest originally affected. The patient was readmitted to hospital with weight 145 lb. and blood-pressure of 110/80. The local condition cleared up after six days. The patient was kept in hospital for twenty-three days for this second attack.

Convalescence again proceeded satisfactorily with steady increase in weight until the last week of the convalescence when the sputum was found to be positive.

(3) Sikh Sepoy, aged 36, fourteen years' service.

Admitted with fibrinous pleurisy right mid-axillary line, nipple level, of fourteen days' duration.

Local signs persisted for fifteen days.

Weight on admission was 114 lb. (Height 5 ft. 10 in.)

Blood-pressure 125/85.

X-ray examination not carried out.

Exercise-tolerance satisfactory.

Patient was discharged after twenty-six days in hospital with weight 118 lb.

Progress was satisfactory with increase of weight and the patient apparently fit when *Myco. tuberculosis* were found in the sputum on the twenty-fourth week.

(4) Sikh Sepoy, aged 25, eight years' service.

Admitted with fibrinous pleurisy nipple area right side of chest of two days' duration. Attack was very mild and local signs disappeared after the patient had been two days in hospital.

Weight on admission was 109 lb. (Height 5 ft. 9 in.)

Blood-pressure 100/75.

X-ray examination of the chest was not carried out.

The exercise-tolerance was satisfactory.

Patient was discharged after twenty-four days in hospital, with weight 114 lb. and blood-pressure 115/75.

Except for a loss of two pounds in weight, the patient's progress during convalescence was satisfactory and he was regarded as almost fit for duty when he was found to be passing *Myco. tuberculosis* in his sputum on the twenty-fifth week, one week before discharge to duty.

(5) Hindu Sepoy, aged 30, eleven years' service.

Admitted with fibrinous pleurisy anterior axillary line, nipple level, right

side chest, of three days' duration. The signs and symptoms cleared up after nineteen days in hospital.

Weight on admission was 118 lb. (Height 5 ft. 7 in.)

Blood-pressure 115/80.

Report on X-ray film of chest was that the pleura in the mid-zone right lung was thickened but there was no evidence of phthisis.

Exercise-tolerance was good.

Patient was discharged after twenty-three days in hospital with weight 121 lb.

Convalescence was satisfactory, until the tenth day, when the patient complained that he felt weak; from that time on there was a steady loss of weight and it was not unexpected when on the fourth week of the course the patient was found to have a positive sputum.

(6) Hindu Mule Driver, aged 32, thirteen years' service.

Admitted with fibrinous pleurisy over the whole of the right side of chest and with moist sounds at the base of the right lung; there was a history of blood-streaking of the sputum.

The local condition cleared up after twenty-one days' stay in hospital.

Weight on admission was 108 lb. (Height 5 ft. 6 in.)

Blood-pressure was 120/80.

X-ray examination of the chest was not carried out while the patient was in hospital.

Exercise-tolerance was poor.

Patient was discharged after thirty days in hospital, with weight of 110 lb.

The convalescence ran an unsatisfactory course but it was not until the sixteenth week of convalescence that *Myco. tuberculosis* were found in this patient's sputum.

X-ray examination of the chest on the fifteenth week also showed evidence of tuberculosis in the middle lobe right lung.

(7) Sikh Sepoy, aged 22, three years' service.

Admitted with fibrinous pleurisy, left mid-axillary line of left side of chest, very localized and mild, of seven days' duration. This local condition cleared up within three days.

Weight on admission was 126 lb. (Height 5 ft. 6 in.)

Blood-pressure 120/70.

X-ray examination of the chest showed no abnormality.

Slight degree of anæmia found.

Exercise-tolerance good.

Patient was discharged from hospital after thirty-two days with weight 128 lb.

Convalescence was satisfactory, and the patient appeared to be almost fit when the sputum was found to contain *Myco. tuberculosis* on the sixteenth week of the observation period.

(8) Hindu Sepoy, aged 30, thirteen years' service.

Admitted to hospital with fibrinous pleurisy, posterior axillary line nipple level, left side of chest, of some days' duration. Local signs persisted for forty days.

Weight on admission was 138 lb. (Height 5 ft. 4 in.)

Blood-pressure 110/75.

X-ray examination of chest showed no sign of phthisis while the patient was in hospital.

Severe degree of hyperchromic macrocytic anæmia with 2,900,000 red cells and 60 per cent hæmoglobin.

Exercise-tolerance poor (due to the anæmia).

Patient discharged after seventy-two days in hospital, weight 143 lb.

Convalescence was proceeding satisfactorily until the ninth week when the sputum was found to be positive.

X-ray examination of the chest on the ninth week confirmed the diagnosis of phthisis.

(9) Hindu Sepoy, aged 33, thirteen years' service.

Admitted with fibrinous pleurisy over the lower lobe left lung. The local condition cleared up after fifteen days in hospital.

Weight on admission was 92 lb. (Height 5 ft. 11 in.)

Blood-pressure was 100/70.

X-ray examination of chest showed no pulmonary lesion.

Exercise-tolerance poor.

Patient was discharged from hospital after thirty days, with weight of 103 lb. and blood-pressure of 118/76.

Convalescence was very unsatisfactory and it was not unexpected when *Myco. tuberculosis* were found in the sputum on the ninth week.

(10) Hindu Mule Driver, aged 19, three months' service.

Admitted to hospital with mild fibrinous pleurisy mid-axillary line left side chest, of six days' duration. These local signs persisted for seventeen days.

Weight on admission was 112 lb. (Height 5 ft. 9 in.)

Blood-pressure was 130/85.

X-ray films of the chest, taken while the patient was in hospital, did not show any phthisis.

Exercise-tolerance poor.

The patient was discharged after a stay of thirty-three days in hospital, with weight 117 lb.

On the second week of the follow-up course, the patient developed a recurrence of the local symptoms in the left side of the chest with a very localized area of friction over that area. This second attack cleared up within a few days and the patient was again sent out after seventeen days in hospital.

Convalescence continued in an unsatisfactory manner, with falling weight and blood-pressure, which latter finally reached a low value of 100/74. (Compare the blood-pressure value of 130/85 when the patient was first admitted to hospital.) At this stage, on the sixth week of convalescence, the sputum was found to be positive.

X-ray examination of the chest confirmed the diagnosis at this stage.

(11) Hindu Sepoy, aged 26, five years' service.

Admitted to hospital with fibrinous pleurisy, nipple area, right side of chest, of three days' duration. The local signs persisted for thirty-one days.

Weight on admission was 136 lb. (Height 5 ft. 8 in.)

Blood-pressure 110/75.

The report on the chest X-ray photograph stated that it showed no evidence of pulmonary tuberculosis.

Exercise-tolerance was poor.

Patient was discharged after forty-two days in hospital, weight 139 lb.

Convalescence was satisfactory, with the weight rising, until the fourth week, when the sputum was found to contain *Myco. tuberculosis*.

Pleurisy with Effusion.

(12) Sikh Sepoy, aged 21, three years' service.

Admitted with serous pleurisy left side of chest of eight days' duration; the fluid level extended to the third rib. The fluid was aspirated and replaced by air

on eight occasions. All specimens of fluid were found to be sterile on direct microscopical examination and on guinea-pig inoculation.

After 180 days the fluid cleared up.

Weight on admission was 126 lb. (Height 5 ft. 10 in.)

Blood-pressure 100/72.

The X-ray photograph of the chest did not show any phthisis.

Exercise-tolerance was poor.

The patient was discharged after 224 days in hospital with the weight 134 lb. and the blood-pressure 115/78.

Convalescence was unsatisfactory and on the sixth week the sputum of the patient showed *Myc. tuberculosis*.

(13) Mussulman Sepoy, aged 24, six years' service.

Admitted with serous pleurisy of left side of chest, with fluid to level of fourth rib, all of one month's duration. The fluid was aspirated seven times and was found on each tapping to be very hæmorrhagic in appearance; all samples were sterile on direct microscopic examination and on inoculation of guinea-pigs. The fluid resolved after 116 days.

Weight on admission was 136 lb. (Height 5 ft. 11 in.)

Blood-pressure was 100/70.

Radiograms of the chest did not show any sign of phthisis.

Exercise-tolerance poor.

Patient was discharged after 182 days in hospital with weight of 145 lb. and blood-pressure of 110/80.

Convalescence was not satisfactory and the finding of the tubercle bacillus in the patient's sputum on the eighth week was not unexpected.

(14) Gurkha Rifleman, aged 28, eleven years' service.

Admitted to hospital with serous pleurisy of right side of chest with fluid up to the level of the fifth rib. History of one week's duration. Fluid was aspirated twice and was sterile on examination by microscope and by guinea-pig inoculation. The fluid cleared up after forty days.

Weight on admission was 109 lb. (Height 5 ft. 3 in.)

Blood-pressure was 105/76.

Radiograms of the chest at this stage did not show any signs of phthisis.

Patient's exercise-tolerance was poor.

Patient was discharged after eighty-four days in hospital with weight 117 lb. and blood-pressure 115/80.

Convalescence was not satisfactory and on the sixteenth week tubercle bacilli were found in the sputum.

(15) Mussulman Sepoy, aged 32, thirteen years' service.

Admitted with serous pleurisy of right side of chest of ten days' duration with the fluid level up to the sixth rib. Fluid was aspirated on one occasion and was found to be sterile both on microscopic examination and on guinea-pig inoculation. It cleared up in twenty-nine days.

Weight on admission was 123 lb. (Height 5 ft. 11 in.)

Blood-pressure was 120/75.

X-ray examination of the chest, taken during the patient's stay in hospital, showed no sign of phthisis.

Exercise-tolerance was poor.

Patient was discharged after fifty-six days in hospital with weight 129 lb.

Convalescence was satisfactory and the patient appeared to be progressing rapidly when his sputum was found to contain *Myc. tuberculosis* on the eighteenth week.

X-ray films taken at this time showed signs suggestive of phthisis.

(16) Hindu Gunner, aged 27, nine years' service.

Admitted to hospital with serous pleurisy right side of chest of two days' duration; the fluid level was at the sixth rib. No aspiration was carried as this fluid absorbed spontaneously by the twentieth day.

Weight on admission was 124 lb. (Height 6 ft. 0 in.)

Blood-pressure was 120/80.

X-ray examination of the chest showed no sign of phthisis.

Exercise-tolerance poor.

Patient was discharged after forty-nine days in hospital with weight 131 lb.

Convalescence was proceeding slowly but satisfactorily when tubercle bacilli were found in the sputum on the sixth week.

(17) Hindu Sepoy, aged 25, six years' service.

Admitted to hospital with serous effusion left side of chest; the fluid was small in amount extending up to the seventh rib. The patient had been ill for three weeks before admission to hospital. Fluid had resolved spontaneously by the thirty-first day.

Weight on admission was 110 lb. (Height 5 ft. 7 in.)

Blood-pressure was 120/80.

X-ray examination was not carried out while the patient was in hospital.

Exercise-tolerance unsatisfactory.

Patient was discharged after sixty-three days stay in hospital; weight 127 lb.

Convalescence continued in an unsatisfactory manner with falling weight and blood-pressure, until the twelfth week, when the sputum was found to be positive.

An X-ray film of the chest taken at this time gave evidence of phthisis in the upper lobe left lung.

SUMMARY.

Fifty-eight soldiers who developed pleurisy while serving in Waziristan were observed for six months after the attack and it was found that seventeen of them became cases of phthisis. The diagnosis in every patient was made on microscopic evidence and was confirmed in five by X-ray evidence.

CONCLUSIONS.

Although the X-ray investigation was incomplete, and the period of six months' observation was undoubtedly too short, the findings of this investigation are sufficient to support the opinion that pleurisy, and particularly serous pleurisy, is a manifestation of latent tuberculosis. The follow-up scheme described above has now been adopted throughout the Indian Army; this should assist in the earlier detection of cases of "open" phthisis and may possibly prevent the breaking down of the borderline cases.

ACKNOWLEDGMENTS.

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THE TREATMENT OF THE SOLDIER'S FOOT.¹

By MAJOR ARTHUR J. HELFET, B.Sc., M.D., M.Ch.(Orth.), F.R.C.S.

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AMONG the more important orthopædic problems in a new army is that of the feet. Large numbers of civilians, many of whom have never been subjected to severe physical strain, have now to withstand the rigours of training. Fourteen months in a Military Hospital have given us time to consider certain aspects and to determine the value of various forms of treatment. We have always aimed at simplicity of treatment.

There are three objects to consider: (1) to ensure that the recruit's feet are capable of marching twenty miles or more a day, carrying full equipment; (2) to fit every soldier's feet to the standard Army boot; (3) to decide whether various operative procedures, designed to relieve pain or deformity, will leave the soldier in Category A1.

CLASSIFICATION.

The classification of deformities of the feet as suggested in the average textbook tends to cause some confusion. One is advised to consider four degrees of rigidity of each deformity and to apply treatment accordingly. It is simpler, however, to follow Sir Robert Jones and to ascertain whether the foot is: (i) *mobile*; (ii) *rigid*; or (iii) is in an *intermediate* stage.

Mobile.—If the foot is mobile, we know that the soldier may be able to—but that we certainly can—hold that foot in any position we wish. For example, a mobile flat foot can be maintained in a corrected position by a boot with a well-fitting, crooked and elongated heel. A course of suitable exercises will now enable the patient to hold this position actively.

Rigid.—If it is completely rigid, we know that the position cannot be altered by anything short of an operation through bone. In other words, we are faced with a fixed deformity. Treatment, therefore, is to correct deformity by operation or to support the foot in the existing position—supports being designed to prevent undue pressure on bony points.

Intermediate.—It is only in the intermediate stages that we are faced with a decision, viz. is it possible to mobilize the foot or not? If so, manipulation or tenotomy is performed and when the foot is mobile it is treated accordingly. If not, the foot must be allowed to become completely rigid in the optimum position, for once it is fixed it is painless, and, as mentioned before, all that is required is the protection of pressure points.

¹ Based on a paper given at a Meeting of the 34th General Hospital Clinical Society.

SIMPLE FOOT STRAIN.

The feet of the majority of soldiers are *mobile* or can easily be rendered mobile. Usually, the only treatment necessary is to build up the foot to enable it to stand up to increased strain, i.e. (a) the muscles must be strengthened ; and (b) the circulation of the skin improved.

(a) *Foot Exercises*.—The importance of exercising the short muscles of the foot must be emphasized. One function of the interossei, lumbricals, short flexors and extensors of the toes and the other short muscles of the foot is to straighten the toes and so form a broad platform, extending from the heads of the metatarsals forward, when walking. If these muscles are too weak or are tired they cannot do this and the toes curl. The long muscles attempt to compensate and thus increase the deformity. Weight is then taken on the heads of the metatarsals and the tips of the toes. If this is prolonged, the patient develops metatarsalgia and corns on the dorsum of the toes. The majority of the men have well-developed calf muscles which are, if anything, over-trained. They complain that pain starts in the foot and it is only after the long muscles have had to take the strain that the ache extends to the calf. Treatment must be directed primarily to strengthening the short muscles.

In this hospital, we start them on non-weight-bearing and then weight-bearing exercises for the short muscles only. Exercises are graded and always given well short of fatigue—for, if exhausted, a muscle does not develop and actually weakens. Faradism may be used with advantage.

We suggest simple exercises of the following types—each should be done six to twelve times :

Non-Weight Bearing.

(1) *Foot Shortening*.—The patient sits with his feet on a towel. The toes are kept extended by pressing them against the towel with the fingers. The patient then attempts to bring his heels towards his toes so that the longitudinal arch lifts slightly. The knees must be kept firmly in position and not be allowed to abduct.

(2) *Toe Raising*.—Raise toes, keeping the ball and rest of the foot firmly on the floor.

(3) *Foot Inversion*.—Keeping the knees together and the outer borders of the feet on the ground throughout the whole exercise, arch and invert until the big toes and balls of the feet touch at the mid-line.

(4) *Toe-Clawing*.—(a) With toes, claw towel into a ball under the foot ; (b) lift pencil or ball of wool, etc., up with the toes.

(5) *Toe Movements*.—Put the foot on a chair so that the heads of the metatarsals and toes just extend over the edge ; (a) Flex and extend the toes, resisting these movements with the fingers ; (b) Spread the toes out as much as possible without flexing them or extending them. If the big toe will not abduct, hold it in abduction and ask patient to try and maintain it in this position.

(6) *Heel Raising*.—Keeping the toes extended and the ball of the foot on the ground, raise heels as high as possible.

Weight Bearing.

Exercises (1), (2), (3) and (6) should be done while standing.

(b) *Skin Circulation*.—In hospital we use all the refinements of a modern massage department to improve skin circulation. It is feasible, however, that a Field Hospital may not always have all the necessary appliances, so, in a series of cases, only twice daily contrast bathing was tried and with satisfactory results. The soldier is taught to give himself these baths. He takes two buckets of water—one as hot and the other as cold as he can stand. The feet are put into the hot water for one minute and then into the cold for half a minute. This is repeated five times. The feet are then dried vigorously with a rough towel, after which the exercises are performed. The whole treatment should take not more than twenty minutes. We have found that with this simple treatment, most feet have become strong and quite comfortable in ten days and the average case is able to return to full duty within a fortnight.

CALLUSES AND CORNS.

These occur only if there is undue pressure over a bony point and the treatment is to relieve pressure. Treatment of the callus or corn itself is not essential but the application of salicylic acid in collodion locally and stimulation of the skin establishes earlier foot comfort.

There are two circumstances in which they arise: (1) in the condition already described where weakness of the short muscles of the foot produces curling of the toes and throws too much weight on the metatarsal heads. The patient would complain of metatarsalgia, develop calluses under the heads of the metatarsals and later corns on the dorsum of the toes. If the deformity is mobile, weight bearing can be taken further back on the foot by applying a metatarsal bar to the boot. The bar must be at least $\frac{3}{4}$ inch wide, $\frac{1}{4}$ inch deep and slant across the boot immediately *behind* the tread. Physiotherapy as described under "Foot Strain" should be instituted. By the time the bar is worn out, the foot should be strong enough to do without it. If there is early rigidity of the foot, tenotomy of the extensor tendons and manipulation should precede these measures.

(2) Where there is a fixed deformity because of which the feet do not fit the boot. The commonest of these are *hallux valgus*, *hallux rigidus*, *hammer toes*, *protruding base of fifth metatarsal* and *protruding heels*. Bare-foot, they would produce no disability, but the friction of a standard boot causes pain. Being fixed deformities, only an operation performed on bone will correct them. A protruding piece of bone on the heel is removed and an unduly prominent base of fifth metatarsal is whittled down. The deformity of a *hammer toe* is corrected by wedge excision of the affected joint. Position is maintained for three or four weeks by means of a stay-suture through the extensor expansion and a collodion splint.

Hallux Valgus.—Many operative procedures have been described for the treatment of hallux valgus. We have found the following to be satisfactory: After a forty-eight-hour skin preparation, the proximal half of the first phalanx of the great toe is excised and the exostoses on the head of the metatarsal are removed. By means of a bandage, the toe is held in line with the inner border of the foot and slightly dorsiflexed. As we are endeavouring to produce a pseudo-arthritis, passive movements are started on the third day and are performed by the patient himself under the instruction of a masseur. After the stitches are removed on the tenth day, general foot treatment, as above described, is given. The patient is not allowed to return to duty until he has gained *active control of the movements of the great toe* and until the muscles of the foot have regained their normal strength.

Hallux Rigidus.—The treatment is the same as for hallux valgus. In the Army, opinion is divided as to whether it is worth while operating on hallux valgus or rigidus. It is held by some that the results do not justify treatment as the soldier will not fit into Category A1 afterwards. We take the opposite point of view as we find that most men, after the above treatment, can wear Army boots and can comfortably return to their duties in an infantry battalion.

FOOT CLINICS.

If large numbers of patients require treatment, the organization of foot clinics relieves congestion and facilitates the work of the massage department. In this hospital, we run one in the morning for in-patients and another in the afternoon for out-patients. The latter is attended by soldiers from nearby units. It is held in the afternoon, firstly, because we find that units can more easily release and arrange transport for their men then, and, secondly, as it enables them to perform light duties in the mornings. Besides saving the time of massage personnel, if a number of patients can be treated together, they have the added therapeutic advantages of example and competition.

I wish to thank my Commanding Officer, Colonel L. A. Harwood, T.D., for permitting, and Lieutenant-Colonel F. A. R. Stammers, Officer-in-Charge Surgical Division, for encouraging and helping me to publish this paper.

Editorial.

A NEW KIND OF SHOCK.

IN the *British Medical Journal* for March 22, 1941, there appeared an account of a phenomenon new to medical records. In an article entitled "Crush Injuries with Impairment of Renal Function," Bywaters and Beall called urgent attention to this disorder; Beall, Bywaters, Belsey and Miles described a further case; Mayon-White and Solandt gave details of still another; while six fatal cases and five ending in recovery were recorded as having been collected by the Medical Research Council Sub-Committee on traumatic oedema.

As the effects of "crush" injuries are just as likely to be met with by medical officers engaged in the rescue and care of soldiers after the bombing of houses and shelters as by their civilian brothers, it is thought well to call attention to this newly described type of casualty.

The lesion is of a curious nature and involves questions of physiology which are deeply interesting as well as very intricate.

The reason why it has not been described before is that it follows a type of injury not hitherto met with. It is part of the new "civilization," associated with an advancing science, and is directly produced, under its direction, by the brain of man.

The facts may be described as follows:

A human individual is suddenly caught under a part of his or her collapsing home. The cases described are, of course, of all ages and both sexes, a girl of 15 years old, a woman of 45, a man of 34. All are equally liable to be weighted down with masonry under the conditions necessary to produce this new kind of shock.

The pressure on limbs or trunk continues and becomes less and less endurable.

"A youth aged 17 was pinned down by three dead bodies under timber and rubble for fourteen hours." "When a bomb demolished a hostel, a young male leather worker of 20, of medium height and good physique, was buried under the debris and his left leg was crushed against the side of an iron bedstead by a heavy metal girder." These cases are typical of all the others and the crush of living tissue goes on for hours until the rescue party digs its way to where the victim is imprisoned.

The patient is then liberated and, after a period of resuscitation, appears fairly well and likely to recover. There may be no other injury than a badly contused or lacerated limb. Fracture may or may not be present. The patient, after an intravenous transfusion of plasma or serum, loses much of his shock and appears to be, on the whole, improving. The injured limb, however, has become whealed and shows marked oedema, but this,

too, tends to diminish as the first days pass. But, to the trained observer, the signs convey a different impression. The urine is ominously small in quantity and often contains a remarkable number of blood casts, or casts containing a blood-like substance. The blood-pressure is low, the hæmoglobin is raised, the urea and blood potassium are high. Everything points to a retention of certain elements in the blood stream and their suppression in the urine.

Mayon-White and Solandt describe their case as one of "limb compression ending fatally in uræmia" and this would appear to be the usual termination of severe cases though one or two appear to have got over the uræmic stage only to die of an intercurrent septic condition.

The last stage, in a majority of the cases, appears to be one of an increasing percentage of hæmoglobin in the blood, a marked increase of blood urea, and a very small excretion of smoky urine with a positive benzdine reaction. There is other evidence of blood concentration as well as that here given; an increase in the protein, an increase in the chlorides; and the blood urea totalled 770 mg. per 100 c.c. in one of the recorded cases!

The local whealing and the amount of œdema were often intense. Oscillometer readings were made in some persons and fell much below normal. The cases were evidently of extreme severity. And yet they often appeared to get much better except for the tendency to a diminished amount of urine and an intense concentration of the blood, often relieved by transfusions but coming to the front again as the effects of the addition of fluid to the blood passed off.

What was the cause?

The kidney tubules were found to contain an eosin-staining substance with some of the characters of a blood-derivative but which proved to be without free iron. Some blood was excreted as a rule. The urine was often dark and smoky and free blood cells were found in the kidney substance, while the benzdine reaction was commonly positive; but the substance forming casts and occupying the tubules, and occasionally the Bowman's capsules of the glomeruli, was different from blood, containing no free iron.

How was this accumulation in the tubules started and was it the cause or the effect of the blood concentration?

These are problems to be settled in the future when more cases come to be examined. The Medical Research Council hopes that, in any cases of this kind reported, attention will be paid to the following points:

(1) Presence of anæsthesia or whealing; (2) œdema—daily extent and progression (circumference measurement); (3) pulse in the limbs and, if possible, oscillometric readings; (4) blood pressure, initial and daily readings; (5) initial hæmoglobin measurements and biochemistry of blood (serum for potassium and urea); (6) urine, daily from time of entry, quantity, colour, and examination for blood, albumin and casts. It is hoped that our officers, if they meet cases of this kind, will collect these facts as far as possible.

In the meantime, other views have been put forward.

It has been said that the treatment was too drastic ; that the principal need of the patients is warmth and rest ; that the use of cases for the collection of data on blood-chemistry and the like is a mistake. In the *British Medical Journal* of April 19, 1941, G. S. Swan gives " A History of the Rescue and After-Care of two cases after four days' burial," and the astonishing fact is recorded that both these cases, bound down by the timbers and debris of falling houses for the period named, recovered completely after a very close approach to death. Shock, in both cases, was severe. Thirst was marked. " Urine, tested daily, revealed nothing abnormal and the output was never less than 75 per cent. of the intake." Here is seen the sharpest difference between these cases and the instances already quoted. It is clear that the effects of pressure vary within very wide limits and that 14 hours of intensely applied weight may have a more destructive effect than 101 hours of mere burial under rubble !

To us it seems that the examination of the urine for quantity, and for the presence of blood, albumin and casts, is of prime importance and that, where this excretion is much diminished, the blood chemistry also must receive the attention of the surgeon and be modified, as far as possible, by treatment.



WELFARE AND EDUCATION.

MAJOR-GENERAL H. WILLANS, *C.B.E., D.S.O., M.C., T.D.*, Director General of Army Welfare, addressed a large audience at the Royal Society of Arts, Adelphi, London, W.C.2, on March 9, on the subject of "Army Welfare and Education." His address was a valuable one and he dealt thoroughly with his subject. Speaking of the need for welfare work—the General hates the word "welfare," which he thinks may convey to some the completely wrong idea of "Charity," but he uses it in the hope that the steady efforts of the Department may lead everyone to appreciate its true meaning—he makes it quite clear that the relief of monotony is a prime need in his organization. "I want you to realize," he says, "that boredom may be a worse enemy than the Germans ; it is during periods of inaction that leadership is taxed, for it is at such times that grievances incubate and eventually emerge." It is the General's aim to give the troops "something to do and somewhere to go" in their spare time. He has therefore devoted "particular care and thought to the provision of entertainment, both live and pictorial, and to supplying men with canteens and hostels where they can feel at home and escape for the time being from the atmosphere of discipline and training." The lecture ended as follows :

"We will try to grapple with the problem, and I promise that whatever happens we will not be disheartened. As in Welfare so in Education, we must have one eye on the future when hundreds of thousands of men will clamour to be the first to return to a world which will offer a welcome only to those who are qualified and willing. Before that time comes we must fortify the soldier with the necessary technical or professional ability and educate him to the right attitude of mind. For the moment we are engaged in a life and death struggle, and the future is rightly regarded as the concern of the future, but it is never too soon to think and to plan and the knowledge that thought is being given in itself contributes to our present task of winning the war because it brings encouragement to anxious men.

"Here, then, is what we are trying to do : To keep open minds, to keep a sense of proportion, always to be on the lookout, never to be satisfied with what has been done, never to be disheartened. At least we realize the magnitude of the task that is before us, and we realize its importance ; it requires no overheated imagination to see a time when morale may be more vital than tanks or aeroplanes. The responsibilities of leadership in these times are crushing, the opportunities endless. Ours is the great opportunity ; we will try not to fail the men, who are the salt of the earth, any more than they will fail us."

Clinical and other Notes.

ATYPICAL SMALLPOX.

BY MAJOR P. F. PALMER,
Royal Army Medical Corps.

THE clinical history of Private P., 2nd Suffolks, aged 22, is as follows :—

March 22.—Patient was in his fourteenth day in hospital, undergoing malarial treatment, when in the evening, he complained of an itching rash on his neck and headache. Temperature was 99·6° F. He had no sore throat. Since the ward was closed for scarlet fever it was thought that the rash might be scarlet.

March 23.—Patient passed a normal night. Morning temperature was normal, headache and rash were still present. There was nothing to be made out on physical examination. That evening the temperature was 100·6° F., pulse 74. Headache was more severe, shivering had occurred, there was mild conjunctival injection and he now complained of backache.

March 24.—During the night he perspired freely and vomited once or twice. Morning temperature 99° F., pulse 84. The rash on the back of the neck was an angry red and irritable. In the evening headache became more severe, likewise backache ; axillary glands were tender and shotty. Evening temperature was 99·4° F., pulse 84.

March 25.—Patient passed a restless night ; copious vomiting, sweating freely. Morning temperature was 100·8° F., pulse 100. Conjunctival injection was now marked. There was photophobia, the face was swollen and suffused. There was slight pharyngeal congestion and the tongue was clean. The rash on the neck was unchanged. In addition there was slight discrete punctate erythema, in places petechial, over both groins and lower abdomen ; case thought to be of typhus group infection, i.e. fourth day rash petechial in nature, discrete palpable glands, suffused eyes and face. There was a small indurated nodule somewhat like a hard chancre on the scrotum, thought possibly to be a tick bite since the patient said that he had removed from that spot a small insect "all legs" which was stuck into his skin. He showed four very good vaccination scars of infancy. His Army Form B 178 had the entry "vaccinated 1933, modified." Blood was taken for Widal culture and Weil Felix reaction. During the day vomiting continued. Skin was dry and burning. There was slight punctate erythema on the forearms and chest and discrete papules on the palms of the hands and on the forehead somewhat deep in the skin. The petechial rash on the abdomen and glands was more marked.

March 26.—Patient passed a bad night. There was extreme restlessness and face and eyes were now congested. Tongue was dry with a slight central fur. There were a few more discrete papules. The back was clear of all rash. There was slight tremor of the hands. Morning temperature was 103·4° F., evening temperature 104·4° F. Total white-blood count was 5,700, of which 74 per cent were polymorphs. There was albumen in the urine.

March 27.—Vomiting was incessant; tongue dry and hard; rash well out, showing macules, papules and erythema. The rash on groins was more petechial; patient was restless and inclined to be delirious.

March 28.—Rash florid on face, trunk, limbs, palms and soles. Delirium continued with temperature 103° F., to 104° F. Investigations of the 25th now available. Blood culture showed Gram positive cocci on two plates.

Widal reaction :—	25.3.38.
	Ty. 70.
	A. 70.
	B. 30.
	T.O. 1/50.
Weil Felix :—	OX2 —Trace 1/25.
	OX19 —Trace 1/25.
	OXK —Trace 1/50.

White blood-count was repeated; total 14,000, of which 63 per cent were polymorphs. There was a strong odour from the patient. He said he had a sore throat and felt very ill.

March 29.—Temperature normal, following crisis during the night. There was no collapse. The patient was covered with raised papules. Some felt like buttons to touch, some showed slight umbilication, some were petechial. There was a fine granular rash, petechial in places, on the palate and the tongue. There was a large subconjunctival hæmorrhage in the left eye. The rash looked typical of smallpox. There were tender painful glands in each groin, left axilla and the back of the neck.

March 30.—Temperature 99° F. Patient showed a typical smallpox face. There were vesicles beginning on the body but the back was free from rash.

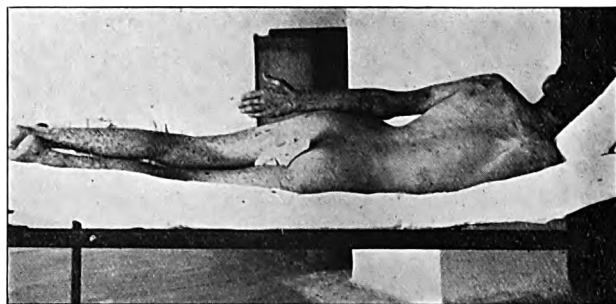
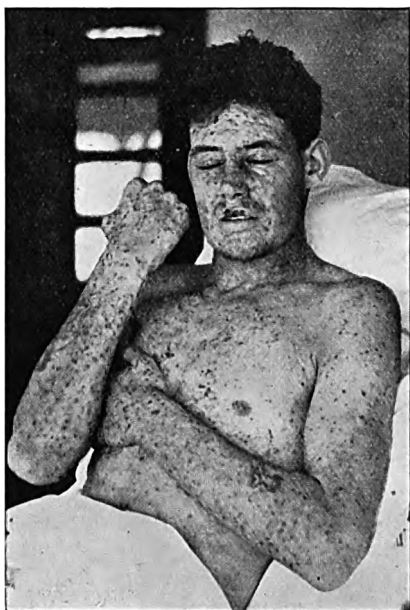
March 31.—The rash was pustular in places.

April 1.—No advance in vesiculation; if anything, vesicles smaller and beginning to be hæmorrhagic. There were deep-seated hæmorrhagic blebs on the pulp of the fingers and toes.

April 2.—Hæmorrhage occurred into all the vesicles. Case afebrile. Further history uneventful.

Diagnosis: The diagnosis of smallpox was not made till the typical rash appeared. Until that time the case was thought to be a typhus group infection. There seemed no reason why the case should be smallpox. The patient was well vaccinated and revaccinated and the source of infection was not obvious. The petechial character of the rash, the discrete palpable glands and suffused eyes and face, together with the story of what must have been a tick bite, and evidence of such a bite, seemed to indicate

that here was a case of typhus, definitely due to a tick bite. With this object in view the case was photographed. In the light of later events the march of the case was typical. The petechial rash on the groins was the usual prodromal triangular rash occurring in about 8 to 9 per cent of cases, to be later followed by the typical eruption beginning on the wrists and fore-



head. Had the days been counted in periods of twenty-four hours, instead of by calendar days, then the rash would be on the third evening, making it a typical third-day rash, i.e. smallpox.

The rash itself was of interest inasmuch as the development was atypical. Vesication had hardly begun before it was followed by hæmorrhage into

the pocks. In places, it will be seen from the photograph that the rash was confluent and, too, distribution of the rash was atypical on the trunk. The rash was the reverse of what usually occurs. Ker in his description of the eruption says, "even in severe cases the chest is often comparatively slightly involved and the abdomen escapes most cheaply of all. The scalp is generally much affected, as is also the back." This was not so in this case where the chest and abdomen were covered with rash and the back almost bare. A sequel of the case was the development of a winged scapula which, later, after a few months completely recovered. What the original erythema on the neck was, I do not know. It was red and angry and irritative in nature and later showed dry branny desquamation.

Ætiology: Successful vaccination is known to confer a complete immunity for a certain number of years, probably seven to ten, and thereafter a partial immunity to the disease, meaning that, in the case of exposure to a really heavy infection, the disease can occur but will be mild and may be modified in nature. There is no doubt of successful original vaccination, since there are well marked scars, but there is grave doubt of the later revaccination. There are two possibilities to be considered: Firstly, that the second modified vaccination was a true indication of lack of complete immunity since the patient developed the disease. Secondly, that the revaccination classified as modified, was not a "take," and that complete immunity from the original vaccination had lapsed. This raises the question of the use of the term "modified" vaccination, and what is meant by such a term. It appears simpler to speak in terms of "successful" or "failed" vaccination. There is the possibility that immunity in this patient was only of a temporary nature. I myself have twice carefully vaccinated an old Quarter-master, and in both cases the vaccination failed, only to be followed by a red hot "take" after a severe attack of influenza. The possibility that failure in the first two cases was due to bad vaccine or bad technique is unlikely since the patient had been previously vaccinated very many times and had always failed to "take." This raises the supposition that protection may be temporary or may be altered by a severe illness.

Conclusion: A case of atypical smallpox is described in a well-vaccinated person. A winged scapula occurred as a sequela. Photographs are shown.

Permission has been kindly granted by Lieutenant-Colonel E. P. Allman Smith to send these notes for publication.

HAND CARRIAGE OF WOUNDED.**BY CAPTAIN W. D. LIVINGSTONE SMITH,***Royal Army Medical Corps.*

A REPORT is submitted, with illustrative photographs, for favour of publication.

The rough, hilly type of ground which abounds in the North-West portion of India has struck me forcibly as very unsuitable for stretcher carriage of casualties, either by two or four bearers, the rear bearer or



FIG. 1.



FIG. 2.

FIG. 1.—Casualty in illustration has G.S. wound of right leg, dressed temporarily, and he is being supported by a S.B. ; the stretcher sling has been passed over his head, crossing behind the upper part of thighs and held out in front by casualty (or S.B.) ready to be passed over head and one shoulder of "carrying" bearer.

FIG. 2.—Carrying S.B. in position.

bearers being unable to pick their path, and causing a very rough and stormy passage for the casualty. Hand-carriage appears to be much more practical and less tiring to the bearer when crossing such country and, as it is highly desirable that the bearer should have his hands free, when necessary, I advocate this method, using one or more stretcher slings. The type of transport put forward is just a modification of that used by Eastern troops when the sling is placed across the forehead. Our troops, entirely unaccustomed to such strain on the neck, find this practically

impossible, while passing the sling across the bearer's chest, as illustrated, produces the same results and is much less tiring to the bearer.

One point I would like to stress is that the actual loading of the bearer is not primarily intended to be self attained. It is much easier if another bearer assists and makes minor adjustments, if necessary, so as to ensure maximum comfort to casualty and bearer. The latter can rest during a long carriage by returning to a position illustrated approximately in Fig. 3.



FIG. 3.



FIG. 4.

FIG. 3.—Casualty leans forward and allows tension on sling to be taken up. Bearer is about to rise to his feet, being assisted, if necessary, by assistant bearer, who is supporting casualty. If casualty is unconscious or unable to use his hands, the front straps of his webbing can be attached to webbing of carrying bearer to ensure his position as illustrated.

FIG. 4.—Bearer in standing position with casualty in pick-a-back position. Bearer's hands are free, if necessary, and his right hand can be used to immobilize injured leg of casualty.

REPORT ON A CASE OF MULTIPLE INJURIES.

BY CAPTAIN M. J. G. FURNELL,
Royal Army Medical Corps.

SIGNALMAN D. W., aged 22, a despatch rider, crashed into the back of a lorry in the blackout. I did not see him before he died, but non-medical witnesses stated that he died within ten minutes of the accident.

The body was seen by another Medical Officer just after death, and by me for the first time on the next day, when I was present at the autopsy performed by Dr. Peter Milligan, M.B., M.R.C.P., Honorary Pathologist to Doncaster Royal Infirmary, by whose kind permission I am reporting this case.

There were no external signs of injury beyond a few grazes on the chin and no bones broken anywhere. Some bloodstained froth was exuding from the nostrils and mouth and there was a considerable quantity of blood in the nasopharynx. There was no damage to the skull nor was the brain affected. There was a small hæmatoma under the aponeurosis covering the anterior surface of the sternum towards its lower end, but, apart from this, no damage could be found to any of the bones or muscles of the chest wall. There was an extensive right hæmothorax due to two large tears in the right lung, one near the hilum and the other on the parietal surface of the lower lobe. Both lungs were riddled with hæmorrhages varying in size from petechiæ to areas of a couple of inches in diameter. They also showed acute pulmonary œdema with much pink froth in the bronchi. There was a large hæmo-pericardium due to rupture of the wall of the right auricle. There were many petechial hæmorrhages and several larger ones, up to the size of a florin, in the pericardium, endocardium and myocardium. There was a tear 3 inches long inside the left auricle, just above the mitral valve, involving the myocardium but not completely rupturing the wall.

A large right retroperitoneal hæmorrhage was also present and the right kidney contained hæmorrhages of all sizes.

The injuries were apparently caused by the sudden compression and re-expansion of a young and elastic chest wall. A similar force would probably have fractured the ribs and sternum of an older subject.

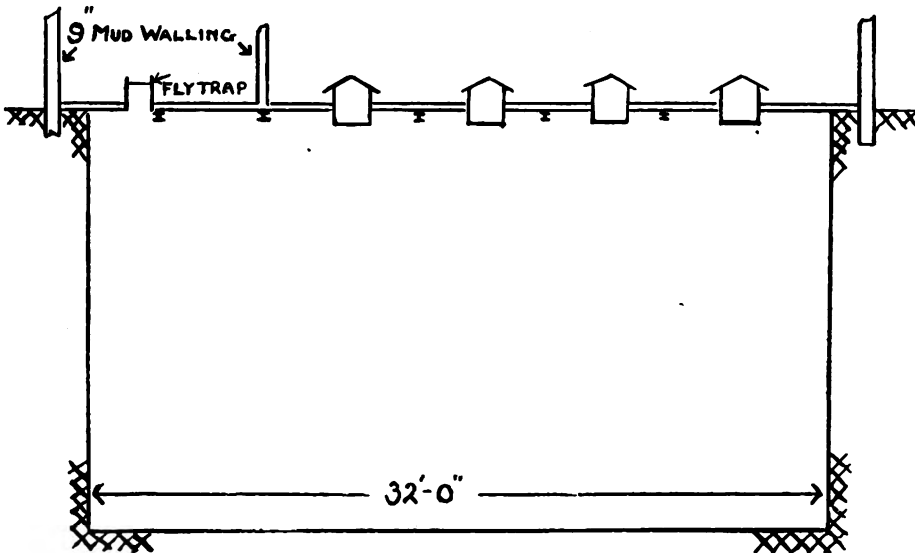
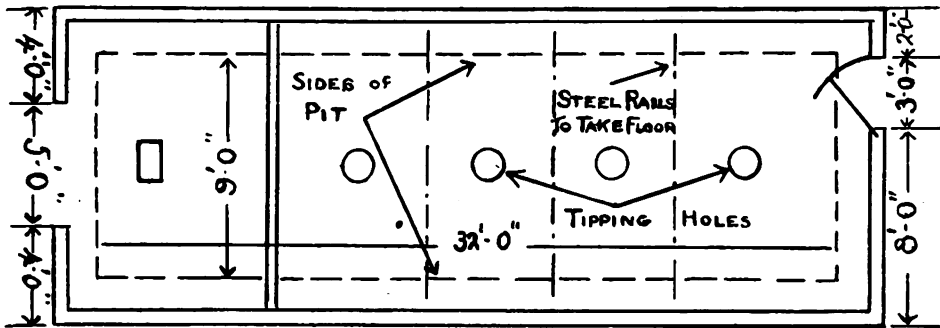
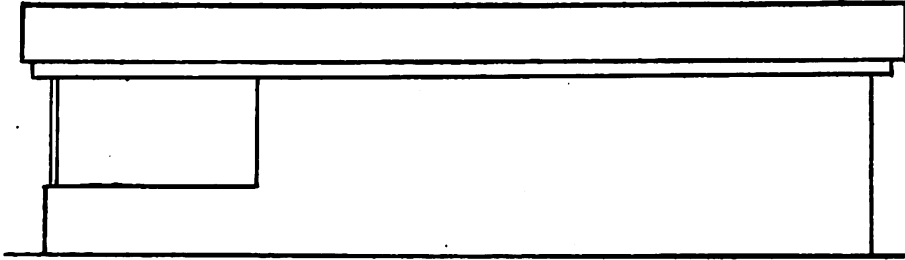
The interest of this case seems to me to be: (1) That such extensive internal injuries can be caused without any apparent external damage and even in the absence of any fracture of a bone. (2) The similarity of the injuries to the lungs to those sustained in injuries from blast, as reported in the *British Medical Journal* recently (January 18, 1941, Hadfield and Christie, p. 77, and elsewhere in the same issue).

SOME NOTES ON AN IMPROVED TYPE OF OTWAY PIT.

BY MAJOR W. J. ROBERTSON,
Royal Army Medical Corps.

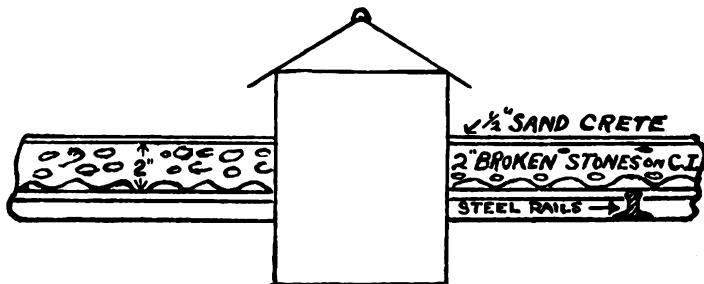
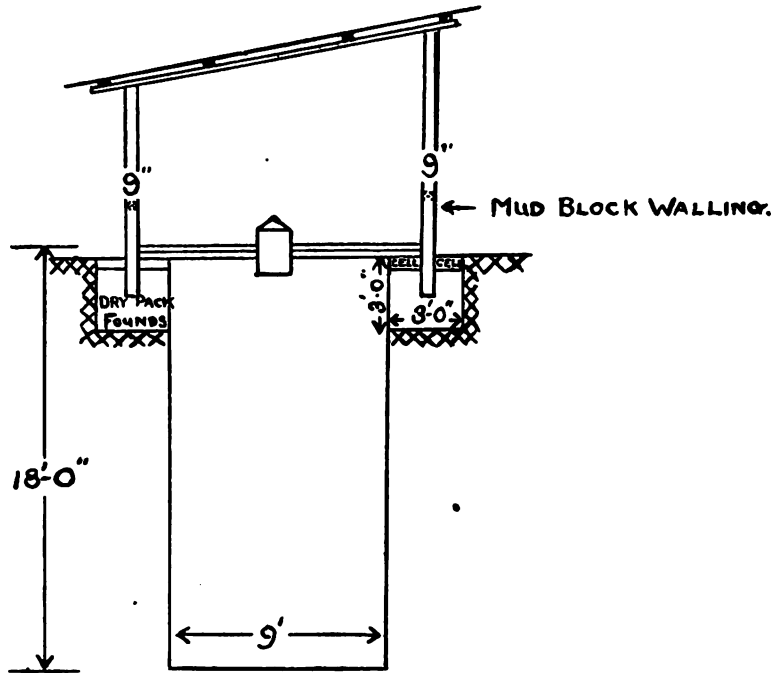
WHEN Freetown was reopened as a station for Imperial troops, a new barracks mainly for African gunners was built. The question of the disposal of excreta arose and as dry earth closets are the general practice here, it was decided to construct Otway Pits of the pattern used by the Civil Health Department. This is a modification of the Otway Pit, and was

IMPROVED TYPE OF OTWAY PIT.



worked out by P. Osment, Sanitary Superintendent, Health Department of Sierra Leone (late a/Q.M.S., R.A.M.C.).

This is certainly a most simple and effective method of dealing with the excreta of a moderate-sized community and would appear suitable for camps, etc.



The pit is excavated 18 feet deep, 32 feet long and 9 feet wide. Such a size has been found capable of dealing with the excreta of a community of 300 for approximately two years.

Lengths of old steel rails are used to support the floor, which is made

of C.I. sheets surmounted by 2 inches of broken stones and covered with $\frac{1}{2}$ inch of sanderete (washed sand 8 to cement 1). Sanderete is used as being easier to break up than concrete when the pit is filled.

Around the top edge of the pit dry pack founds are made supporting 9-inch mud-block walls, all made from the soil of the pit. Facing the walls with sanderete increases their durability. Such walls are 12 inches from the pit edge and the floor extends all round to meet them. At the fly trap end of the pit apertures are left in the walls to admit light. One wall is made slightly higher than the other to permit of a sloped roof made of corrugated iron on wooden battens with an overlap of 12 to 18 inches on each side. Corrugated iron roofing, although more expensive, is much more efficient than thatching with palms or reeds, as this latter type of roof very soon becomes pervious and causes scouring of the floor and edges of the pit.

Old sanitary dustbins are used as tipping holes but, instead of one, as is usual in this type of pit, four are provided at equal intervals down the length of the filling portion. It has been found by experience that, with only one filling hole, usually situated at the end of the pit, the excrement does not find its own level but banks and the pit appears to be filled when actually not more than half full.

With the improved pit, filling is done through the nearest hole until the mass rises to floor level, when No. 2 hole is taken into use, and so on till the mass reaches the floor by No. 4 hole. At this stage it will be found that some settling has taken place and the cycle can be repeated from No. 1 hole.

The fly trap used is the normal type made from a kerosine box with roof and trap of mosquito wire. Such traps are easily and cheaply made and can be immediately replaced as they become unserviceable through termites, exposure, etc.

When a pit is full it remains in that condition for twelve months, after which time an opening can be made around one of the filling holes and the matured contents removed. To facilitate removal one or more C.I. sheets may be taken from the roof. After emptying the floor and roof are replaced and the pit is again ready for use. There is in this Colony a keen demand for the matured contents for flower gardens.

A pair of such pits used as described will last for twenty years or longer.

A stand pipe is erected adjacent to the pits with a hose and nozzle attached so that latrine buckets can be washed on the site and the washings emptied into the pit. This addition of water to the pit has the action of making it into a form of septic tank. It is undesirable to use cresol in the latrine buckets in this system, as the cresol destroys the bacteria and interferes with the maturing of the pit contents. Sawdust or dry earth to cover the faeces is the best method.

Current Literature.

MEDICAL RESEARCH COUNCIL. INDUST. HEALTH RESEARCH BOARD.
 Industrial Health in War. A Summary of Research Findings
 Capable of Immediate Application in Furtherance of the National
 Effort. Emergency Report No. 1. pp. iv + 28. 1940. London :
 H.M.S.O. [6d.]

The issue of this report is opportune when a tendency is growing to forget the lessons learnt in the last war, viz. that human beings are not machines of which the output is steady however many hours they are kept going. Indeed, many cases are quoted of output being greatly increased by reducing the over-long hours insisted upon. It is foolish extravagance to pay for work done during incapacity from fatigue. Misguided efforts to stimulate workers to feverish activity in the supposed interests of output are as useless as would be the cheers of partisans encouraging a long-distance runner to a futile sprint early in the race. The remedy for fatigue is rest ; otherwise energy's reserve capital is called upon. Over-long hours should be avoided and also continuous work without intervals for rest. Sunday rest and ordinary holidays should be given. Alleviate boredom by varying work or even providing such a distraction as music. Cut out unnecessary movements and effort at repetition processes. Increases in sickness-absence, in accidents and in labour wastage are danger signals. The importance of good lighting to vision is stressed ; the standards which should be maintained are stated. The chief requirements for satisfactory heating and ventilation are summarized, having regard always to maximum efficiency at different processes. The majority of accidents result from factors under personal control ; experienced workers have far fewer accidents than newcomers. The best workers have less lost time and fewer accidents than inferior workers. Inexperienced workers require supervision. Machines should be run at regular and optimum speeds. Those "accident-prone" should be placed upon safe work. Records must be kept of all lost time and of labour wastage. Efficiency goes with good health, both bodily and mental. Discontent is a thief of output. Much, indeed, is known ; and the need for the moment is rather for application of knowledge previously gained than for new research.

E. L. COLLIS.

Reprinted from "Bulletin of Hygiene," Vol. 15, No. 8.

¹ This abstract is of special importance at the present time.

Reviews.

CEREBROSPINAL FEVER. By Denis Brinton, D.M.Oxon, F.R.C.P.Lond.
Edinburgh : E. and S. Livingstone, 1941. Pp. vii + 163. 4 Plates.
Price 8s. 6d. net.

The author explains in his preface that this account of cerebrospinal fever was written owing to the "need for a small book in which the whole subject was briefly reviewed and the essential features of the new treatment were simply stated."

The book contains nothing that is new and the treatment described is that which has been followed by the great majority of practitioners since the present greatly increased incidence of the disease began at the end of 1939. The clinical types of cerebrospinal fever are dealt with as fully as the treatment of the disease, and the publication will be of value in further emphasizing the need for early diagnosis and the immediate exhibition of a suitable preparation of the sulphonamide group of drugs. There can be little doubt that the continued education of the profession on these two points has done much to reduce still further the mortality rate of cerebrospinal fever as compared with six months ago. It is to be hoped that this improvement will continue.

The early part of the book is concerned with the epidemiology, ætiology and pathology of the disease. It is unfortunate that the author has relied for much of his information on the literature produced as the result of experiences during the 1915-18 outbreak. It is not suggested that the observations recorded were not correct but the generalizations that followed many of these observations have not been confirmed by work carried out more recently. The overcrowded barrack-room, the carrier rate and the incidence of the disease was the triangle on which all discussions on cerebrospinal fever were based. Investigations undertaken during the last ten years have failed to demonstrate any definite relationship between the bed spacing of barrack-rooms, the carrier rate and the incidence of the disease. Experiences of the present outbreak bear this out fully.

The book contains a great deal of useful clinical information but the method of presentation is not good. It is frequently difficult to appreciate the exact meaning the author wishes to convey. For instance, at the beginning of page 21 the predisposing influence of infections of the upper respiratory passage on the incidence of cerebrospinal fever is denied yet at the foot of the same page it appears to be fully accepted as an important factor.

H. J. B.

THE PHARMACOLOGY AND THERAPEUTICS OF THE MATERIA MEDICA. Sixteenth Edition (Revised). By Walter J. Dilling, M.B., Ch.B. London: Cassell & Company, Ltd. 1940. Pp. x + 602. 12s. net.

The fact that this small volume has passed through sixteen editions and twenty-three reprints since its first publication fifty-six years ago is sufficient testimony to its continued popularity.

The present edition appears to have been brought well up to date and includes the new pharmacopœial names, recently published by the British Pharmacopœia Commission, for drugs, many of them previously manufactured under patent by enemy countries and described under registered trade names but now manufactured by British firms.

The general format of the book as well as the *pabulum* appear excellent but I have some minor criticisms to offer concerning a few of the newer drugs mentioned.

Pamaquin (plasmoquine) is stated to be effective in benign tertian and quartan malaria. Our experience, a fairly extensive one, is that plasmoquine, alone, has little effect on either of these two infections during the *acute phase*, and, on this account, should never be used as a substitute for quinine or atebirin, either of which is effective during the acute attack. The chief therapeutic virtues of plasmoquine lie, firstly, in its effective action on the gametocytes of all forms of malaria, secondly, in its dramatic effect on the relapse rate, especially of benign tertian and quartan malaria. In other words, plasmoquine is a poor schizonticidal drug but an effective gametocidal remedy, whereas quinine and atebirin are exactly the reverse.

The dose of plasmoquine recommended, 0.06 g. daily for four to seven days, is rather higher than that now considered safe or advisable and, if followed, would probably result in a crop of minor toxic by-effects. Of the two important toxic side-effects observed during medication with plasmoquine, namely, colic and cyanosis due to methæmoglobinæmia, only the latter is mentioned.

No mention is made of certuna (cilional), closely allied to plasmoquine, but stated to be less toxic and more effective.

Writing of mepacrine hydrochloride (atebirin) the author states that "in urgent cases it can be given intravenously (0.3 g.) in 5 mls of normal saline." This method of administration is not recommended even by the manufacturers. Most physicians prefer atebirin for injection (mepacrine methanesulphonate) given by intramuscular injection deep into the muscles of the buttock. Absorption into the blood stream is almost as rapid by this as by the former route and it is far safer.

A note of caution should be sounded in future editions on the danger of administering plasmoquine and atebirin concurrently or mixed in the same pill. There is solid evidence to show—although some authorities disagree—that if given together the toxic effects of each are greatly enhanced. Our experience definitely supports this view.

In the section dealing with quinine and malaria mention is made of only



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British Medical Journal,
Nov. 9, 1940, p. 628.



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three species responsible for the latter infection in man, viz., *Plasmodium vivax*, *P. malariae*, and *P. falciparum*. *P. ovale*, causing a form of benign tertian malaria, is now generally conceded as a fourth species.

The mature, bursting, malaria trophozoite is usually called a mature schizont and not a merocyst.

Dealing with the selective action of quinine on the malaria parasite the author remarks: "Statements that quinine is most actively toxic to the spores and therefore need only be in maximum concentration in the blood at the moment of sporulation are of theoretical interest but not of practical utility." Most of us who have had extensive experience in the treatment of malaria will support this view, although there are physicians, mostly of the older school, who withhold quinine until a certain stage in the malaria attack in order that the maximum concentration of the drug may be reached in the blood stream at the optimum moment. In our opinion the practical disadvantages envisaged in this method of exhibiting quinine far outweigh its theoretical possibilities, especially if large numbers of patients are under treatment, when it is all important that the drug be given at regular and definite intervals throughout the day at times suited to nursing requirements rather than to phases in the cycle of the infecting parasite, commencing as soon after the disease is diagnosed as possible.

The author recommends following the normal five to seven day course of quinine by a further course of the drug, in reduced dosage (10 grains daily), for two to three months. An alternative method, sponsored by the Malaria Commission of the League of Nations (4th General Report published in 1937), is to treat the primary attack with quinine in full dosage (30 grains daily) for five to seven days. Further medication is then stopped unless or until relapses occur when each relapse is treated on its merits as for the primary attack. Still another method, especially useful in hyperendemic foci of the disease or where for any reason it is imperative that individuals should be kept on their feet and out of hospital, is to follow the normal seven-day course of quinine by the drug in much reduced dosage (six grains daily) throughout the period that the individual is at risk. In this case the small daily dose of quinine acts as a clinical (but not causal) prophylactic.

In the section dealing with the treatment of malignant tertian malaria it is not, perhaps, sufficiently stressed that cerebral malaria constitutes a grave medical emergency and requires somewhat heroic measures if the patient's life is to be saved. Quinine, given by intravenous injection, is generally considered to give the patient his best chance; other methods of administration are too slow and uncertain.

Mention is made of quinine-resisting forms of malaria. There is very little evidence that such exist (at least, not in the sense of arsenic-resisting trypanosomes in sleeping sickness). Failure of a malaria attack to respond to quinine can usually be attributed to some other cause, usually within the competence of the patient or his physician to remedy. Amongst these may be mentioned: sophistication of the quinine product used—a common

source of trouble in India ; failure to take the drug on account of its bitter taste or of its reputation as " gut rot " ; faulty absorption due to gastritis, constipation, etc. Tanret's test for the presence of quinine in the urine is a valuable bedside guide to absorption and is well worth mentioning in a future edition.

Writing of emetine in the treatment of amœbiasis Dr. Dilling recommends half-grain doses thrice daily by hypodermic injection for ten days ; rather a " corvée " for the patient and seldom necessary, except possibly for the first few doses in an exceptionally severe case. A kinder and effective routine method is to administer daily injections, each of 1 grain, for twelve consecutive days. The injection of emetine locally into a liver abscess after aspiration of the pus is not now usually employed ; reliance being placed on daily hypodermic injections.

Emetine bismuth iodide is usually given in one dose of 2 to 3 grains at night with the patient lying comfortably in bed. If there is nausea or a tendency to vomit, a single dose of luminal, 1 grain, or 10 mm. of laudanum may be given half an hour before.

The section dealing with sulphanilamide and its derivatives appears up to date and in most respects satisfactory.

Mention could, with advantage, be made of the paramount necessity of the proper spacing of the drug—four-hourly day and night—during the early phases of an acute infection.

Intrathecal injections of sulphonamide drugs are not usually advised in the treatment of meningococcal meningitis nor is sulphanilamide usually regarded as effective in the treatment of pneumococcal meningitis (Type III infections excepted).

Referring to sulphapyridine the author states that a daily dosage of 12 to 16 g. is required to maintain the bacteriostatic action. This may be so, but the above dosage is somewhat heroic and a larger daily dosage than 8 to 9 g. (exceptionally, 10 g.) is rarely recommended.

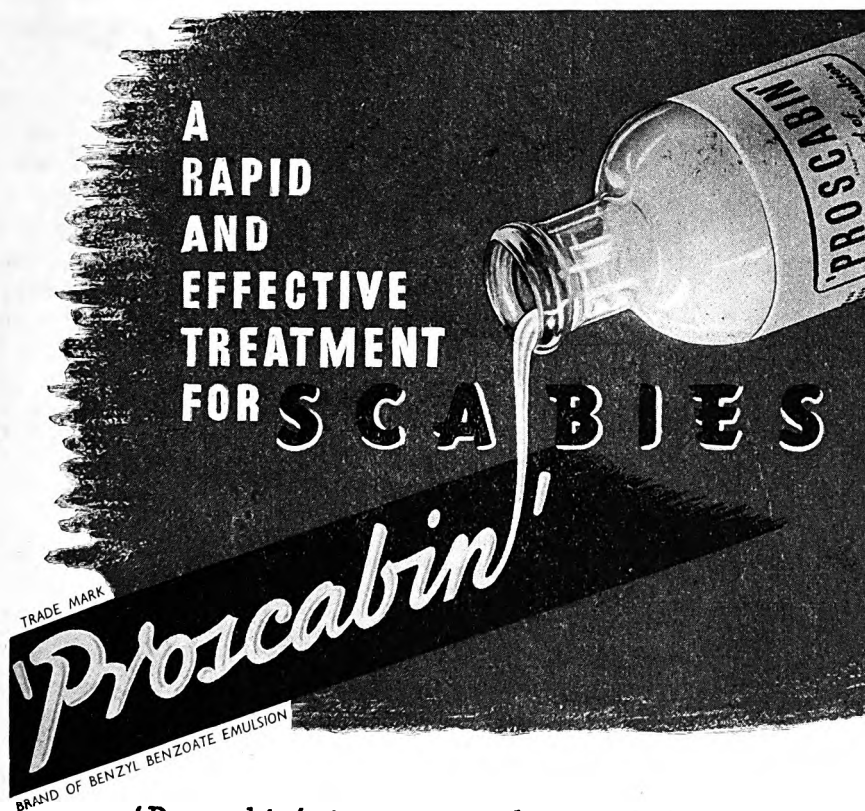
A note dealing with yellow fever and typhus vaccines might with advantage be added to the section on vaccines.

The book is well put together and the printing is good, an important item these days when a proportion of one's reading may have to be done in an air raid shelter with indifferent lighting.

S. S.

VENEREAL DISEASES. By E. T. Burke, *D.S.O.*, M.B., Ch.B.Glas. London : H. K. Lewis & Co., Ltd, 1940. Pp. xv. + 549. Price 30s. net.

The increased interest which venereal disease has aroused as a result of war conditions, more particularly in the Services, is alone sufficient to guarantee a welcome to " Venereal Diseases " by E. T. Burke. This book is extremely well produced and its outstanding features are the really beautiful coloured plates and photographs. To a reviewer who holds views on many important points diametrically opposed to those of the author, fair criticism is almost impossible ; perhaps the fairest way is to point out



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that, though many of the views propounded are hardly in accord with general opinion, they are at least ingenious and provide much food for thought; not only that, they *make* the reader think. A study of the theory and practice of "efficiency indices" may well give the budding venereologist a headache whilst the statement that the gonococcus is *never* intra-cellular (p. 335) is calculated to upset the equanimity of the most level-headed pathologist.

This is a stimulating book full of wise clinical observation, more suitable for the fireside armchair than the busy V.D. treatment room.

ESSENTIALS OF GENERAL ANÆSTHESIA, WITH SPECIAL REFERENCE TO DENTISTRY. By R. R. Macintosh, M.A., M.D., F.R.C.S., D.A., and Freda B. Pratt, M.D., D.A. Oxford: Blackwell Scientific Publications, Ltd. 1940. Pp. xi + 334. Price 25s.

This is an instructive, well written and exceptionally well illustrated work of some 300 pages.

Though primarily concerned with general anæsthesia for dental purposes, nevertheless the principles of general anæsthesia for general surgery are sufficiently indicated. As the title suggests, no attempt is made to deal with local, regional or spinal anæsthesia, or to discuss the many anæsthetic techniques used in general surgery.

In most works on general anæsthesia the space devoted to anæsthesia for dental operations is not large and, in this respect this book, dealing as it does with this branch of general anæsthesia in great detail, fills a definite gap in the literature.

The history of general anæsthesia is not long but even so contains the seeds of controversy; the book opens with an eminently fair and full account which agrees with the known facts.

The authors favour the oxygen deprivation theory of anæsthesia, i.e. that the phenomena of anæsthesia are due to anoxia. They do not, however, accept nitrous oxide as simply an oxygen replacer but postulate that it should be regarded as a mild inhibitor of one of the enzymes in the process of cell oxidation.

The chapters on respiration and cyanosis are welcome features. Too many professional men embark on the administration of inhalational anæsthesia with only the vaguest ideas of the physiology and physico-chemistry of the respiration or the true meaning of cyanosis, e.g. an anæmic patient under a general anæsthetic may die of anoxæmia without showing cyanosis.

Most anæsthetists will support the authors' contention that the average physician is singularly unhelpful in deciding the choice of anæsthetic in doubtful or poor risk cases and that the proper person to consult in such cases is preferably a second anæsthetist. The authors illustrate this contention with four cases from their own experiences.

Pre-anæsthetic medication is fully dealt with, as is the subject of general

anæsthesia for children. The authors prefer to recognize a *status periculosus* rather than a *status lymphaticus*. This postulates an idiosyncrasy to the depressant effects of an anæsthetic drug rather than a pathological entity.

As regards the vexed question of deaths from chloroform in the early stages of chloroform anæsthesia, the authors attribute these to ventricular fibrillation caused by the liberation of the patients own adrenalin into the blood-stream in susceptible subjects. No reference is made to vagal stimulation in high vapour concentration.

The induction and maintenance of anæsthesia with nitrous-oxide given nasally is dealt with very fully. Endotracheal anæsthesia is fully discussed and well illustrated. The emergencies that may arise in the course of general anæsthesia administered for dental operations are dealt with in detail.

Tracheotomy is discussed and well illustrated, and an instructive book closes with a chapter on the legal responsibilities of the anæsthetist.—

J. M. S.

A TEXTBOOK OF BACTERIOLOGY FOR DENTAL STUDENTS. Second Edition.

By Arthur Bulleid, L.R.C.P.Lond., M.R.C.S., L.D.S.Eng. London : William Heinemann (Medical Books), Ltd. 1938. Pp. xviii + 207. Price 15s. net.

This textbook should prove an invaluable asset to dental students and practitioners alike. It portrays bacteriology, as far as they are concerned, in a concise and well classified form and obviates the necessity of wading through large textbooks on general bacteriology.

Chapters XI to XIV are of particular interest to practitioners and to students attached to General Hospitals as the importance of a detailed knowledge of the bacteriology of dental lesions cannot be stressed too much and especially those showing active pus formation with inevitable toxic absorption.

The technique for the preparation of dental smears and cultures is well tabulated, simple, and embraces everything necessary to ensure good results.

This book should undoubtedly put a new outlook on the field of oral bacteriology and, as a work of reference, prove a very valuable asset owing to its concise and, at the same time, highly explanatory nature.

J. W.

Correspondence.

TO THE EDITOR OF THE "JOURNAL OF THE ROYAL ARMY MEDICAL CORPS."

MY DEAR CUMMINS,—Despite stresses, I feel that I must make an effort to secure a little more adequate recognition of the national value of the wonderful services rendered by the late Sir William Horrocks during our last war. Tributes have been paid in the JOURNAL OF THE ROYAL ARMY MEDICAL CORPS to his qualities and to his services as its editor, but no adequate reference has been made to his contributions to our victory in the field. It is because that omission is probably due to the fact that no other survivor shares my intimate knowledge resulting from working directly under his orders that I feel impelled—in justice to his memory—to bring those services to the notice of the R.A.M.C. as it mourns the passing of one of its most distinguished scientists.

I propose to illustrate his great practical services in two special directions only.

Firstly, as regards the Army water cart, I note that it was on the day after the outbreak of war, and hence just in time, that I completed to Sir William's satisfaction the efficiency tests of the design and action which he had perfected with characteristic thoroughness. My final test showed that water bacterially contaminated even to the extent of opalescence was sterilized by half an hour's routine exposure to chlorine in our water cart, as controlled by use of the "Horrocks Test-box" later so familiar to British troops.

It is impossible accurately to allocate credit among the factors which almost eliminated enteric from our forces during the last war, but this application of scientific methods to water purification in the field undoubtedly contributed to the reduction of enteric from the high level of our previous wars. At the rate obtaining in the South African war, for example, enteric would have cost us about 200,000 lives in the war of 1914-18, whereas it actually caused the death of only 204 of our troops in France.

Secondly, as regards his even more important and successful services when upon the Royal Army Medical Service was thrown the task of devising means of protecting our field forces against poison-gas. While such work might have perhaps more reasonably have devolved upon the R.A. Ordnance Corps, it was indeed fortunate for the Army and the country that Sir William was available and ready to undertake that vital duty.

The success which attended our efforts of scientific initiative, for which he bore the main responsibility, was largely attributable to his remarkable ability to improvise organizations to meet such new and unexpected needs. His capacity for rapid organization was illustrated by the speed of our response to the surprise of the Germans' initial gas-attack at Ypres: although the chemical antidote had to be chosen and purchased and the

textiles bought, cut, stitched, dipped, dried and sent overseas, 160,000 protective pads had been distributed to our front-line troops within sixty hours—a truly wonderful achievement. Before the “Great War” ended no less than 55,000,000 respirators of various kinds had been made, largely to his specifications.

In the light of such evidence it is perhaps not too much to claim that but few individual officers contributed more of practical value and applied science to our victory of 1918 than did Sir William Heaton Horrocks.

University of Edinburgh,

Yours, etc.,

Usher Institute of Public Health,

P. S. LELEAN.

Warrender Park Road.

April 12, 1941.

NOTES ON THE MEDICAL SERVICES OF A DIVISION.

TO THE EDITOR OF THE “JOURNAL OF THE ROYAL ARMY MEDICAL CORPS.”

DEAR SIR,—Reference the Article “Notes on the Medical Services of a Division,” in the March number of the Journal. I would be obliged if you will make the following corrections in the Text :

Page 130, line five, for “show” read “know.”

Page 134, line six, for “D.P.s” read “D.R.s”

Page 134, para. seven, should read, “With the present equipment . . . defensive positions, that are not going lightly to be permitted to fall into enemy hands, the A.D.S. should be . . .” etc.

The substance of these notes was prepared in July and August, 1940, and a considerable delay occurred after submission for censorship before they were printed in the Journal.

Since August, 1940, a considerable modification in the tactical handling of a Field Ambulance has taken place. This is most particularly marked in the Subdivision of the Companies into sections.

Many of the remarks in the article should therefore be read in conjunction with this change in tactics. The basic principles remain the same and I am convinced that the Section principle is a sound one. It is to be hoped that the scheme of forming Sections of the Field Ambulances, for close liaison with the infantry battalions is the germ of the idea of making the Field Ambulance a true evacuating unit and that the process of evolution will result in the introduction of more vehicles to enable us, having collected our casualties, to evacuate them with the utmost speed to the place where their injuries can receive the treatment they so urgently need.

I would be obliged if you can see your way to publishing this apology for the apparent “out of dateness” of some of the remarks in the article referred to above.

Headquarters 44 Division,

Yours, etc.,

Home Forces.

J. C. DOWSE,

April 11, 1941.

Colonel.

For all Wounds

Powerful and prolonged protection

Flavogel presents acriflavine (1 in 1,000) in a water-soluble jelly base. This base, smooth and soothing in application, enables the acriflavine to penetrate to every part of the wound, and working mutually with the tissues, allows full bactericidal action. Swelling is reduced around inflamed areas by the exosmotic action of the jelly. Flavogel should be used on all wounds, whether infected or not. It is directly indicated as a protective dressing for septic conditions. Flavogel should be applied direct from the tube and covered with a suitable dressing. It does not cause pain, and tends to prevent the dressing from sticking to the wound. 1½ oz. tubes and 16 oz. jars.

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Typhoid Satisfactory immunization, without undue reaction, is secured with 2 injections of Anti-typhoid Paratyphoid Dissolved Vaccine Glaxo. The dosage is 0.5 cc., and 1 cc., seven to ten days later.

Gonococcus Full antigenic response without undesirable reactions is obtained by treatment in both sub-acute and chronic manifestations, with Gonococcus Vaccine (subcutaneous) Glaxo. Gonococcus Vaccine (intradermal) Glaxo, often favoured, has evoked commendably high immunological responses and speedy improvement of clinical condition.

Staphylococcal Infections Slowly healing infected wounds, boils, whitlows, etc., are among the infections which yield to treatment with Staphylococcus Dissolved Vaccine Glaxo and Staphylococcus and Streptococcus Dissolved Vaccine Glaxo.

Pustular Acne The efficacy of vaccine therapy in Acne depends on the thoroughness with which the endotoxins are liberated from the bacteria. The introduction of a Dissolved Vaccine Glaxo containing the detoxicated endotoxins of C. acnes and staphylococcus albus has thus brought about a considerable improvement in the standard and consistency of the results in this condition.

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Notices.¹

COD-LIVER OIL AS A DRESSING.

THE British Cod-Liver Oil Producers (Hull), Ltd., call our attention to a paper read by Dr. John Steel, Medical Superintendent of the Smithdown Road Hospital, Liverpool, on the use of this oil as a dressing. Dr. Smith points out that the *pure* oil, not the crude preparation, should be used. Amongst other points in its favour he speaks as follows :—" My experience of pure cod-liver oil as a dressing is that it has a marked effect on specialized tissues which more than compensates for the scent, the almost pus-like exudate, and the exuberant granulations. In addition, it reduces pain (and, in my opinion, consequent shock), allows redressings to be done with a minimum of pain, and the end-result shows the least scar-formation of any dressing I know."

ROCHE PRODUCTS LTD.

WE are informed that Roche Products Limited, Welwyn Garden City, Herts, have opened branch offices at 166, Buchanan Street, Glasgow, C.1, where, for the convenience of Scottish customers, a full range of " Roche " preparations will be carried.

THE PREVENTION AND TREATMENT OF INFECTION IN WOUNDS BY SULPHONAMIDES.

WE have received from Pharmaceutical Specialities (May and Baker), Ltd., a valuable report on " The Prevention and Treatment of Infection in Wounds by Sulphonamides " which, while too long to include as such, is to be warmly recommended to all dealing with such injuries.

The available data, clinical and experimental, concerning the value of the local implantation of sulphonamides in the prevention of wound infection are reviewed. There is evidence that the local implantation of a sulphonamide may prevent, or contribute to the prevention of, primary infection. Implantation should be followed by oral administration, for which purpose sulphanilamide, sulphapyridine or sulphathiazole may be used. Implantation should not be carried out for wounds involving nerve tissue. While sulphapyridine has been suggested by some writers for implantation and has actually been used in this way, it appears that its appropriateness for the purpose ought to be established by experimental investigations, followed, if necessary, by clinical trials.

¹ These notices are for the purpose of acquainting officers with the latest developments in therapeutics, but do not imply that the preparations mentioned have been added to the list of authorized drugs.

The implantation of sulphanilamide or other sulphonamide will be of little or no value in heavily infected wounds where the administration of an appropriate sulphonamide drug on the recognized line is required.

PERCALIN AND MERSALYL.

WE have received from Messrs. Evans Sons Lescher & Webb, Ltd., notices of two new preparations: "Percalin," a concentrated solution of calcium in organic combination for intravenous or intramuscular use in the various disorders for which calcium is usually prescribed; and "Mersalyl," a substance put out as a 10 per cent solution for infection, buffered with 5 per cent of Theophylline, and as suppositories.

Mersalyl solution is said to be indicated in cardiac disorders complicated by cedematous conditions and may be administered concurrently with other cardiac stimulants.

IODOXYL AND INJECTION PHENOBARBITONE.

Messrs. EVANS SONS LESCHER & WEBB, LTD., send us particulars of two of their latest preparations.

(1) Iodoxy (Evans) is a stable, aqueous, 75 per cent solution of Iodoxy B.P. Chemically, iodoxy is the di-sodium salt of N-methyl-3:5-di-iodo-4-pyridone-2:6-di-carboxylic acid, and is a white, odourless powder containing 51.5 per cent of iodine.

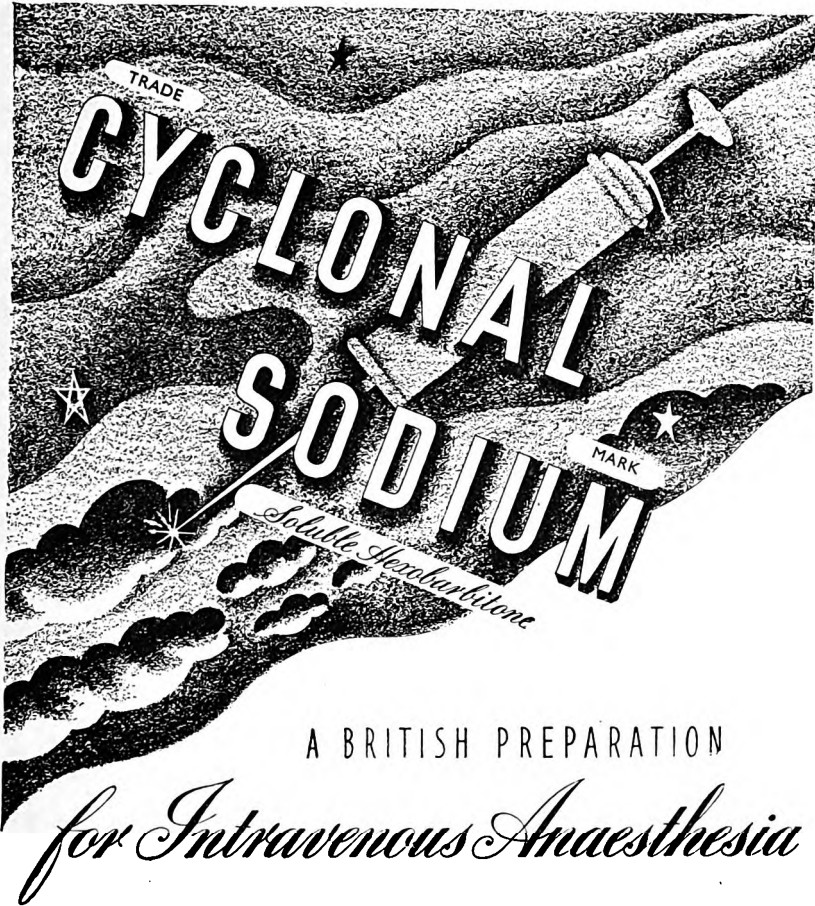
Dosage.—Adults, 20 c.c. intravenously. Children, 10 c.c. intravenously. Infants, 3 c.c. intravenously.

(2) Injection Phenobarbitone (Evans) is a solution of Phenobarbitone B.P. in a special non-toxic solvent. Each ampoule of 1.5 c.c. contains 0.2 gramme (3 grains) Phenobarbitone B.P.

Dosage.—The average adult dose is 1 c.c. injected intramuscularly. Must not be injected intravenously. Children should be given a proportionate dose.

"TABLOID" AMMONIUM CHLORIDE—SPECIAL COATING.

A RECENT introduction by Burroughs Wellcome & Co., of "Tabloid" Ammonium Chloride—Special Coating, permits larger doses of Ammonium Chloride to be taken than otherwise would be the case if ordinary sugar-coated products were used. Local irritation to the stomach lining is prevented by this special coating which remains unaffected by the acid media of the stomach but breaks down in the alkaline media of the small intestine. The combined special coating and sugar coating of "Tabloid" Ammonium Chloride will resist the action of the stomach juices for a period of from three to four hours, complete disintegration taking place in the small intestine.



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JOURNAL OF THE ROYAL ARMY MEDICAL CORPS

Corps News.

MAY, 1941.

EXTRACTS FROM THE "LONDON GAZETTE."

His Majesty The KING has been graciously pleased to approve the under-mentioned awards in recognition of gallant and distinguished services in the field :

The Distinguished Service Order.

Lieutenant James Morton Muir, M.B. (128242), Royal Army Medical Corps.

The KING has been graciously pleased to approve of the undermentioned awards, in recognition of distinguished services in the field :

The Distinguished Conduct Medal.

No. 7516742 Private Laurence Arthur Coe, Army Dental Corps.

The following awards have been made in recognition of distinguished services in the Middle East during the period August, 1939, to November, 1940.

O.B.E. (Military Division).

Lieut.-Colonels (Temporary Colonels) F. G. A. Smith and Q. B. V. Wallace, M.C. ; Lieut.-Colonel J. Melvin, M.C. ; Majors (Temporary Lieut.-Colonels) A. O. Bekenn and J. M. Macfie, M.C., R.A.M.C.

M.B.E. (Military Division)

Lieut. (Acting Captain) G. Lorrinan and Lieut. H. R. Hartnell, R.A.M.C.

MENTIONS IN DESPATCHES.

Colonel (Acting Major-General) P. S. Tomlinson, D.S.O., and Colonel J. C. Sproule, O.B.E., late R.A.M.C. ; Lieut.-Colonel (Acting Colonel) H. Alcock, Lieut.-Colonel D. C. Scott, O.B.E., Major (Acting Lieut.-Colonel) W. A. D. Drummond, Major (Temporary Lieut.-Colonel) F. R. H. Mollan, M.C., Captain (Local Lieut.-Colonel) R. P. Cormack, Lieut. (Temporary Major) D. M. Blair, Captains J. MacMillan and J. B. M. Milne, and Lieuts. G. Geddes and J. B. Heycock, R.A.M.C.

March 18.—Col. (temp. Brig.) O. W. McSheehy, D.S.O., O.B.E., M.B. (15664) (late R.A.M.C.), to be a Dep. Dir. Medical Servs. and is granted the actg. rank of Maj.-Gen. Mar. 1, 1941.

March 21.—The undermentioned, at their own request, revert to the rank stated whilst empld. during the present emergency :

As Maj.s :

Lt.-Col. R. J. Franklin (5463), ret. pay, R.A.M.C. Feb. 18, 1941.

March 25.—The undermentioned retire on ret. pay :

Maj.-Gen. J. W. L. Scott, C.B., D.S.O., K.H.P. (5437) (late R.A.M.C.), Mar. 26, 1941.

Col. A. N. R. McNeill, D.S.O., M.B., V.H.S. (10753) (late R.A.M.C.), Mar. 26, 1941.

Col. (actg. Maj.-Gen.) O. W. McSheehy, D.S.O., O.B.E., M.B. (15664) (late R.A.M.C.), to be Maj.-Gen. Mar. 26, 1941.

Lt.-Col. T. O. Thompson, D.M. (4850), from R.A.M.C., to be a Dep. Dir. of Medical Servs., and is granted the actg. rank of Maj.-Gen. Mar. 26, 1941.

Col. S. W. Kyle, M.B. (5068), ret. (late R.A.M.C.), to be a Dep. Dir. of Medical Servs., and is granted the actg. rank of Maj.-Gen. Mar. 26, 1941.

Maj. R. McKinlay, M.B. (8719), to be Lt.-Col. Mar. 26, 1941.

March 28.—The undermentioned Capt.s. (temp. Maj.s.) to be Maj.s. :

N. P. Breden, M.B. (53103). Mar. 11, 1941.

C. M. Marsden, M.B., F.R.C.S. Edin. (53104). Mar. 15, 1941.

P. T. L. Day (51344). Mar. 25, 1941.

April 4.—*Short Service Commission.*—Capt. W. L. O'Donnell (90092), relinquishes his commn. on account of ill-health. Apr. 5, 1941.

April 8.—Capt. (temp. Maj.) F. K. Bush, M.B. (52041), to be Maj. Apr. 7, 1941.

April 11.—The KING has been graciously pleased to approve the following appointments :

To be Hon. Surgeons to The King.—Col. (temp. Brig.) C. M. Finny, O.B.E., M.B., F.R.C.S. (8132) (late R.A.M.C.), Dec. 26, 1940 (vice Col. B. Biggar, M.B., F.R.C.S. (68833) (late R.A.M.C.) retired).

Col. (Actg. Maj.-Gen.) (now Maj.-Gen.) O. W. McSheehy, D.S.O., O.B.E., M.B. (15664) (late R.A.M.C.), Mar. 1, 1941 (vice Maj.-Gen. F. D. G. Howell, C.B., D.S.O., M.C. (8026) (late R.A.M.C.) retired).

To be Hon. Physician to The King.—Maj.-Gen. J. A. Manifold, *D.S.O.*, M.B. (9044) (late R.A.M.C.), Mar. 26, 1941 (vice Maj.-Gen. J. W. L. Scott, *C.B.*, *D.S.O.* (5437) (late R.A.M.C.) retired).

Short Service Commission.—Lt. (on prob.) J. E. Miller (163133), is confirmed in his rank. Mar. 19, 1941.

April 15.—Lt.-Col. (temp. Col.) D. C. Monro, M.B., *F.R.C.S.* (Edin.), *K.H.S.* (14493), from R.A.M.C., to be Col., Mar. 26, 1941, with seniority July 1, 1938.

Maj. & Bt. Lt.-Col. (temp. Lt.-Col.) A. E. Richmond, *O.B.E.* (9946), to be Lt.-Col. Mar. 26, 1941.

Capt. (temp. Maj.) E. S. Tweedy, M.B. (53065), to be Maj., Apr. 15, 1941.

Col. A. C. H. Gray, *O.B.E.*, M.B. (10101), ret. pay (late R.A.M.C.), at his own request, reverts to the rank of Maj. whilst empld. during the present emergency. Mar. 26, 1941.

Regular Army Reserve of Officers.

GENERAL LIST.

March 28.—Col. J. B. Grogan (4782) (late R.A.M.C.), having attained the age limit of liability to recall, ceases to belong to the Res. of Off. Sept. 20, 1940.

April 1.—The undermentioned having attained the age limit of liability to recall, cease to belong to the Res. of Off.:

Maj.-Gen. H. Ensor, *C.B.*, *C.M.G.*, *C.B.E.*, *D.S.O.*, M.B. (Col. Comdt. R.A.M.C.) (9805). Mar. 20, 1941.

Col. C. J. Wyatt, M.B. (15106) (late R.A.M.C.). Oct. 8, 1940.

April 11.—Col. A. E. S. Irvine, *D.S.O.* (11037) (late R.A.M.C.), having attained the age limit of liability to recall, ceases to belong to the Res. of Off. Apr. 11, 1940.

April 15.—The undermentioned cease to belong to the Res. of Off. on account of ill-health. Apr. 16, 1941:

Lt.-Col. I. R. Hudleston, *D.S.O.* (50542).
Capt. C. W. Simpson, M.B. (38216).

THE ARMY DENTAL CORPS.

March 21.—Maj. C. E. Day (31210), h.p. list, retires, receiving a gratuity, on account of ill-health. Mar. 4, 1941.

April 4.—Capt. W. A. O. Roe (45095), to be Maj., Mar. 25, 1941.

QUEEN ALEXANDRA'S IMPERIAL MILITARY NURSING SERVICE.

March 28.—The undermentioned Sisters resign their appts.:

Miss A. W. Elwood. Feb. 20, 1941.

Miss A. Saxby. Mar. 31, 1941.

The undermentioned Staff Nurses to be sisters:

Miss J. F. McA. Brims, Nov. 14, 1940, with seniority next below Miss M. J. Baird.

Miss E. M. Talbot, Feb. 1, 1941, with seniority next below Miss E. F. Shine.

April 8.—The undermentioned Staff Nurses to be Sisters:

Miss A. M. Baker, Feb. 1, 1941, with seniority next below Miss E. F. Shine.

Miss R. M. N. Mansel. Feb. 16, 1941.

Miss W. Wright, Mar. 1, 1941.

April 11.—Staff Nurse Miss L. M. Dobbin to be Sister, Jan. 10, 1941, with seniority next below Miss F. J. Parry.

ROYAL ARMY MEDICAL CORPS AND THE ARMY DENTAL CORPS COMFORTS GUILD.

IN some recent notes, we mentioned a variety of ways in which money has been raised for the Guild. We have now to add that in one military district our friends organized a most successful dance, the resulting profit of £112 making a very welcome addition to our funds. We should like again to express our thanks to the organizers.

There is now a badge issued to members of recognized Working Parties through the Director of Voluntary Organizations at a cost of 6d.

The Honorary Secretary has arranged to obtain a number of these badges, and will

send them to the organizers of Working Parties for the Guild for issue to members.

The conditions upon which the badges are issued are as follows:

"The badge certifies that the wearer is a regular voluntary worker under the National Scheme, and that he or she has rendered service to the country for a period of not less than three months, and is still continuing work.

"Any worker purchasing a badge shall sign an acknowledgment to include an undertaking to cease to wear the badge on ceasing to perform regular work."

The badge is a brooch in attractive red

enamel, with the words "For the Forces" underneath, and surmounted by a lion in silver.

As the supply of badges is limited, an early application with Postal Order is desirable.

Address requests to the Honorary Secretary, R.A.M.C. and A.D. Corps Comforts Guild, R.A.M.C. Headquarters Mess, Millbank, S.W.1.

NOTICE.

The Annual General Meetings of the R.A.M.C. Fund and the R.A.M.C. Officers' Benevolent Society will be held at the R.A.M.C. Headquarter Mess on Monday, June 9, 1941, commencing at 2 p.m.

KILLED IN ACTION.

BIRD.—In France, on June 18, 1940, Lieutenant Donald Alfred Bird, R.A.M.C., attached to 1st East Surrey Regt. Born in Canada Dec. 19, 1914, he took the

L.R.C.P., L.R.C.S. Edinburgh, and the L.R.F.P.S. in 1939. He had only taken a short service commission in the R.A.M.C. on Sept. 1, 1939, as Lieutenant.

DIED OF WOUNDS.

FERRO.—On Mar. 19, 1941, Captain Anthony Alfred Ferro, R.A.M.C. Born in Malta, June 14, 1914, he was educated at Malta University, where he graduated M.D. in 1937. He entered the R.A.M.C., on Oct. 27, 1937, and was promoted Capt. Oct. 27, 1938.

McKILLOP.—On June 11, 1940, Lieutenant John Murdock McKillop, R.A.M.C. Born Mar. 3, 1914, he was educated at Glasgow University where he took the M.B., in 1938. He was commissioned as Lieutenant R.A.M.C. on Sept. 14, 1939.

DEATHS.

RUSSELL.—On Jan. 12, 1941, Major-General John Joshua Russell, C.B., late R.A.M.C., Retired. Born Sept. 26, 1862, he was educated at Trinity College, Dublin, where he graduated M.B. in 1885. Gazetted Surgeon July 28, 1886, he became Major R.A.M.C. July 28, 1898, Lieutenant-Colonel July 28, 1906, Colonel Mar. 1, 1915, and Major-General Feb. 7, 1918. He retired Feb. 7, 1922. He served in the South African War in Cape Colony, being awarded the Queen's Medal with Clasp and the King's Medal with two Clasps. He served in France from Aug. 5, 1914, till Feb. 1918, at first in command of 5 General Hospital and later as an A.D.M.S. and a D.D.M.S. Thrice mentioned in despatches he was awarded the C.B., 1914 Star, British War and Victory Medals.

till Sept. 9, 1920. Mentioned in despatches in the *London Gazette* of July 10, 1919, he was awarded the 1914 Star and Clasp, British War and Victory Medals.

LOWE.—On Feb. 20, 1941, Captain William Edmund Lowe, Quartermaster R.A.M.C. Retired. Born April 28, 1869, he enlisted Jan. 28, 1889. He served 18 years and 246 days in the Ranks and 6 years 207 days as a Warrant Officer. Gazetted Quartermaster and Hon. Lieutenant April 26, 1914, he was promoted Hon. Captain July 1, 1917, and retired April 28, 1924. He served in France from Aug. 18, 1914,

CLARKE.—In Rathfarnham, Co. Dublin, on Mar. 4, 1941, Colonel Thomas Henry Matthews Clarke, C.M.G., C.B.E., D.S.O., late R.A.M.C., Retired. Son of Staff Surgeon Thomas Henry Matthews Clarke, Colonel Clarke was born in Nassau, Bahamas, on June 15, 1869 and educated at Trinity College, Dublin, where he graduated M.B. in 1895. Commissioned Surgeon Lieutenant Jan. 28, 1897, he served in the operations in Crete in 1898 taking part in the affair of Sept. 6, 1898, in which he was wounded, leading a sortie to the rescue of a wounded man; half the sortie party being killed or wounded. Colonel Clarke was mentioned in despatches and awarded the D.S.O. He was promoted Captain Jan. 28, 1900, and seconded whilst his services were placed at the disposal of the High Commissioner of Crete from Jan. 14, 1901, till Nov. 22, 1903. Personal Physician to Prince George of Greece 1900—1903 he was appointed a Knight of the Order of the Saviour (Greece) and in 1903 created C.M.G. He was the

author of "Sanitary Work in Crete"; "Blue Book, Turkey, No. 1"; and "Pre-historic Sanitation in Crete," *British Medical Journal*, 1903. Promoted Major Jan. 28, 1909, he became Lieutenant-Colonel Mar. 1, 1915, Colonel Jan. 27, 1918, and retired Feb. 1, 1920. He served in France in 1915—1916, being mentioned in despatches and awarded the *C.B.E.*, 1914-15 Star, British War and Victory Medals.

PRIESTLEY.—In Yateley, Hants, on Mar. 16, 1941, Lieutenant-Colonel Harold Edgar Priestley, *C.M.G.*, *R.A.M.C.* Retired. Born Jan. 24, 1879, he was commissioned Lieutenant *R.A.M.C.* July 31, 1905; Promoted Captain Jan. 31, 1909, Major Oct. 15, 1915, and Lieutenant-Colonel Mar. 30, 1930. Placed on half pay on account of ill-health Feb. 1, 1932, he retired on account of the same, Aug. 20, 1932. He proceeded to France Aug. 18, 1914, and became prisoner of war. He was one of the six *R.A.M.C.* Officers who volunteered to take up at Wittenberg Camp, the duties abandoned by the German Medical Staff. The conditions in this camp during a rigorous winter were appalling. The men's overcoats according to Mr. Justice Younger's Committee had been taken from them on their capture. Many were without boots and socks—having their feet wrapped in straw. Colonel Priestley found them gaunt, of a peculiar odour and verminous. No communication was permitted with the outside; the food was passed in for the hospital on a trolley worked by winches at either end over twenty yards of rail to avoid all contact with the outer world. The food for the camp was pushed in over chutes. Three of the six *R.A.M.C.* officers died. Colonel Priestley was left with health impaired. He was mentioned in despatches for devotion to duty and valuable services rendered during epidemics of cholera and typhus in the camp and created *C.M.G.* He was awarded the Gold Life Saving Medal of the Order of St. John of Jerusalem. He was thanked by the Army Council for his valuable report on the camp. The Army Council also expressed their appreciation of his devotion to duty. At the end of 1916 he was employed on the Hospital Ship "Britannia" and mentioned in despatches for valuable services rendered on the occasion of sinking of hospital ships. He served in Egypt in 1917. He received the 1914 Star and Clasp; the British War and Victory Medals.

MCCLOGHRY.—In South Africa on Mar. 18, 1941, in South Africa Captain Charles Edward McCloghry. Born Nov. 11, 1912, he graduated *M.B.*, Belfast, in 1936. Gazetted Lieutenant (Short Service Commission) *R.A.M.C.* April 23, 1937, he was promoted Captain April 23, 1938.

MIDDLETON.—Colonel Edward Meredyth Middleton, late *R.A.M.C.*, who was killed by enemy action Mar. 20, 1941, was a well-known officer of the Royal Army Medical Corps. An attractive genial personality, yet when he felt a certain course was right he had the courage of his convictions. Well versed in the administrative problems of the Army, those under him always realized that the welfare of the soldier was safe in his hands. He was interested in all forms of sport. His loss will be much felt by a large circle of officers in and out of the service. Eldest son of the late Rev. F. E. Middleton, *M.A.*, Rector of Haynford, Norfolk, he was born there Oct. 10, 1880. Educated at St. Thomas's Hospital and Toronto University, he graduated *M.B.*, Toronto, 1895 and took the *M.R.C.S.Eng.* and the *L.R.C.P.Lond.* in 1906. Entering the service as Lieutenant *R.A.M.C.* Jan. 28, 1907, he was promoted Captain July 28, 1910, Major Jan. 28, 1919, Lieutenant-Colonel Sept. 6, 1931, and Colonel Sept. 26, 1935. He retired Oct. 10, 1937, and was appointed Officer-in-charge Reception Station at Chiseldon. On the outbreak of war he rejoined and was appointed an *A.D.M.S.* In the war of 1914-1921 he proceeded to France on Aug. 14, 1914, and was unfortunate enough to be taken prisoner on Aug. 24, 1914. He returned to England June 29, 1915, and subsequently served in Macedonia and with the Egyptian Expeditionary Force in Palestine. Twice mentioned in despatches he was awarded the *O.B.E.*, 1914 Star and Clasp, British War and Victory Medals.

A correspondent writes:

"The acute sensibility to events of sadness is inclined to be dulled at a period such as this when recurring tragedy is of daily occurrence. Nevertheless the death by enemy action of Colonel E. M. Middleton will come as a shock and engender a feeling of grievous loss amongst his many friends in the Corps. It is hard to believe that so virile and cheerful a character is no longer with us.

"To be known by a nickname is more often than not a real indication of popularity. 'Fruity' Middleton was no exception to this rule. He was held in high esteem and was deservedly popular in the Corps he had faithfully served for thirty-four years. His was a sanguine and cheerful temperament that made him friends wherever he might be; he was essentially a good 'mixer.' During the last war the writer shared with 'Fruity' the unpleasant experience of one year in a prison camp in Germany. The breadth and depth of a man's character was searched in such circumstances. It is sufficient to say that the writer's affection for him was deepened at the end of what seemed to be an interminable incarceration.

"One recalls the badinage between 'Fruity' and an equally popular officer of the Corps of the same term when they came to discuss the respective merits of various 'batches' of officers. They were both equally vociferous in declaiming that 'our batch' surpassed all others that had gone before, or was likely to follow. Indeed, it can be truly said that 'Fruity' Middleton's personality did much to justify the intentional extravagance of their description of its merits.

"It required little exercise of the imaginative faculty to picture 'Fruity' cheering those around him by his composure and nonchalance before a crashing bomb sped his generous soul to eternity. Whilst mourning his death his many friends will be gladdened by having known him."

BEACH.—In Reading on April 3, 1941 Colonel Thomas Boswall Beach, *C.M.G.*, *C.B.E.*, late *R.A.M.C.*, Retired. Colonel Beach was a son of the Rev. Canon Beach, *M.A.*, *C.F.* Born in Brompton, May 28, 1866, he was educated at Bloxham and King's College, London. At Bloxham he was Head Prefect, played in the school cricket eleven and took several prizes. He obtained 2nd Class honours in the Senior Cambridge Local Examination. At King's College he obtained a Warneford Entrance Scholarship and a further Warneford Scholarship for Resident Students. He took prizes for Divinity (1st year), anatomy, materia medica, surgery, clinical medicine, with Todd, Jelf and Warneford Medals. He was Dresser and Clerk to Lord (then Sir Joseph) Lister and Clinical Clerk to Dr. (afterwards Sir David) Ferrier. He took the *L.R.C.P.* and *M.R.C.S.*, London, in 1889. One of a number of able men who elected to join the Army Medical Service in the early nineties, he passed second into Netley and first out, winning the Herbert Prize and Montefiore Medal. Commissioned Surgeon (his batch was the last batch to be gazetted Surgeon) Jan. 31, 1891, he became Major Nov. 29, 1900 (special promotion for service in the South African War), Lieutenant-Colonel Mar. 10, 1912, Colonel Mar. 1, 1915, and retired Dec. 27, 1919. He received the thanks of the government of India for his services during a very severe outbreak of cholera at Lucknow in 1896. He served in the South African War taking part in the advance on Kimberley including actions at Belmont, Enslin, Modder River and Magersfontein. He was present at the operations at Paardeberg, actions at Poplar Grove, Dreifontein, Vet River and Zand River, actions near Johannesburg, Pretoria and Diamond Hill and action at Belfast. Mentioned in despatches and specially promoted Major he was awarded the Queen's Medal with seven Clasps and the King's Medal with two Clasps. In the

war 1914-21 he served in Egypt and with the Egyptian Expeditionary Force, as *S.M.O.*, *A.D.M.S.* and *D.D.M.S.* Twice mentioned in despatches he received the *C.M.G.*, *C.B.E.*, 1914-15 Star, British War and Victory Medals. Since retirement he had lived at Reading with his mother and sister, interesting himself in work on the management of the Royal Berkshire Hospital and also taking much interest in local sporting matters. He had been in indifferent health most of the time since his retirement; these trying conditions he endured with very great fortitude and he was cheery and companionable to the last. Going through life, contributing to the happiness of others largely by his urbanity and good humour, he has left a host of friends fortunate in having served with one of his mental and professional calibre.

O'FLAHERTY.—On Apr. 8, 1941, in Westward Ho, Lieutenant-Colonel Austin Romuald O'Flaherty, *R.A.M.C.*, Retired. Born in Killarney, Feb. 7, 1870, he took the *M.R.C.S.*, *L.R.C.P.*, London, in 1901, having taken the *L.S.A.* in 1897. Commissioned Lieutenant July 27, 1898, he was promoted Captain July 27, 1901, Major Apr. 27, 1910, Lieutenant-Colonel Mar. 1, 1915, and Retired Mar. 30, 1921. After retiring he practised in Devon and was an Ex-President of the North Devon Branch of the British Medical Association. He served in Sierra Leone in 1898-1899, receiving the Medal with Clasp. He was, in 1899, mentioned for showing considerable pluck in assisting to quell a disturbance at Panguma, Sierra Leone. In 1900 he was the means, through his judgment and tact and self reliance, of suppressing a very serious quarrel which would have led to a serious loss of life between the West African Regiment and Frontier Police at Panguma. For this he received the thanks of Governor and Council. He was in South Africa in 1902, being awarded the Queen's Medal with three Clasps. From Feb., 1916, till the end of the war in 1918, he served in Mesopotamia. Twice mentioned in despatches, he received the British War and Victory Medals.

FIGG.—At Southampton, on Apr. 10, 1941, Major Charles Arthur Figg, *O.B.E.*, Quartermaster, *R.A.M.C.*, Retired. Born Sept. 3, 1874, he enlisted May 3, 1893. He served in the ranks 17 years, 172 days; as a Warrant Officer 3 years, 294 days, and was in possession of the Long Service and Good Conduct Medal. Commissioned Quartermaster and Hon. Lieutenant Aug. 12, 1914, he was promoted Hon. Captain Aug. 12, 1917, and Major Aug. 12, 1929. He retired Sept. 3, 1929. "Charlie" to his friends, he was one of the best known

and deservedly popular officers, both commissioned and non-commissioned, in the Corps. All who served with him were impressed with his upright character and sterling qualities. As company Staff Serjeant at the Depot he was brought into immediate contact with all ranks of the Corps and had a marked influence on the recruits under his charge. He served in the South African War, taking part in the Defence of Ladysmith, the actions at Laings Nek and Belfast. He received the Queen's Medal with three Clasps and the King's Medal with two Clasps. He served in France from Aug. 1914 till the end of the war. Thrice mentioned in despatches he was granted the next higher

rate of pay and awarded the *O.B.E.*, 1914 Star, British War and Victory Medals.

KAVANAGH.—On Apr. 19, 1940, Lieutenant-Colonel Edward James Kavanagh, *D.S.O.*, *M.C.* Born Nov. 5, 1881, he graduated *M.B.* at the Royal University of Ireland in 1906, and was gazetted Lieutenant, *R.A.M.C.* July 30, 1906. Promoted Captain Jan. 30, 1910, and Major July 30, 1918, he retired with the rank of Lieutenant-Colonel July 30, 1926. He served in France and Belgium from Aug. 18, 1914, till the end of the war, being mentioned in despatches thrice. He was awarded the *D.S.O.* in 1918, the *M.C.* in 1915, 1914 Star, British War and Victory Medals.

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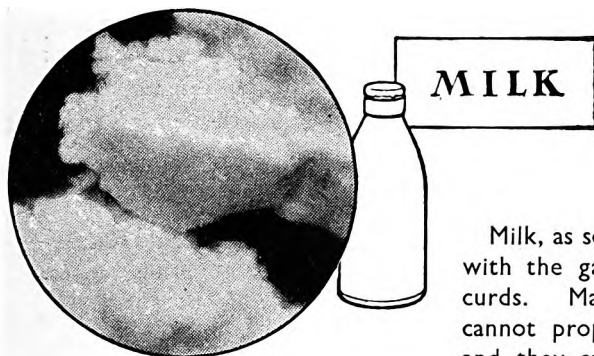
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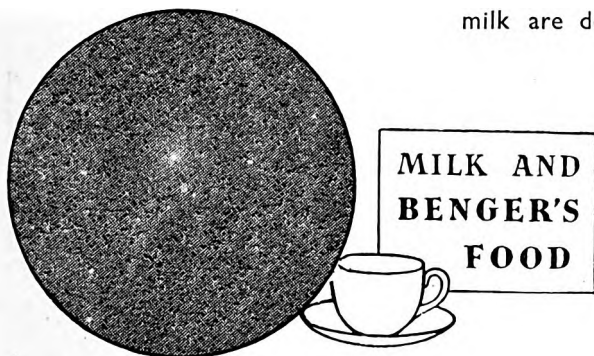
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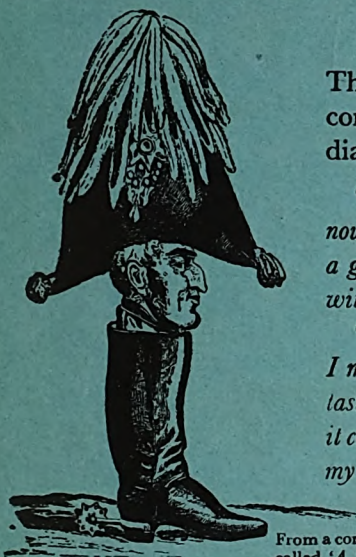
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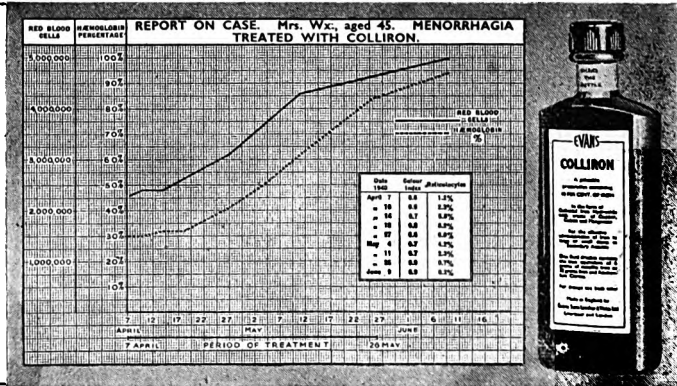
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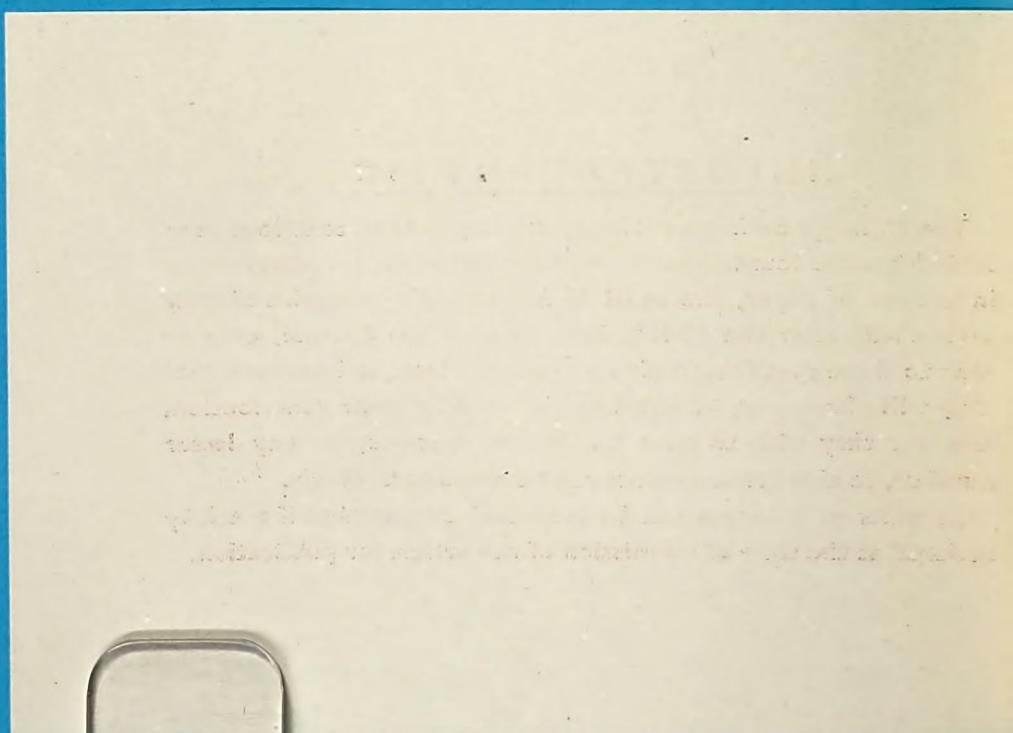
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THE WORK OF A REGIMENTAL MEDICAL OFFICER.¹

BY COLONEL D. STEWART MIDDLETON, F.R.C.S.

It is no doubt attributable to the unprecedented conditions under which we now find ourselves at war that the organizers of the Honyman Gillespie Lectures have chosen this subject.

"The Work of the Regimental Medical Officer" is not by any means an easy subject and strikes a very different note from the matters of scientific interest which have preceded it in this year's lectures. It may, however, prove to be informative to the senior student or junior graduate to whom it is addressed and who is likely in the course of time to be invested with His Majesty's Commission in the Royal Army Medical Corps.

INTRODUCTION.

It is well that the recipient of an Emergency Commission should realize the importance of the duties which he undertakes when posted to a unit as a Regimental Medical Officer. A very senior officer has stated indeed "that the members of the medical services are the most powerful people in the British Army when they use their knowledge properly." The medical officer is faced with a task which will not only form a test of the instruction which he has received while an undergraduate in the wide range of preventive medicine but will also emphasize the presence or absence of those powers

¹ Honyman Gillespie Lecture, delivered September 12, 1940. Reprinted by permission from the *Edinburgh Medical Journal*, N.S. (IVth), Vol. LXVII, and through the courtesy of the Honyman Gillespie Trustees.

of adaptability and initiative which are of as much importance as his technical knowledge as a student.

The duties of the medical officer bring him into contact with the fundamentals of the preventive and corrective aspects of disease in an intimate fashion which is never possible in civil work and he thereby gains an insight into medicine which forms an admirable foundation for practice later on. He must also, however, if he is to be effective, develop into the soldier as well as the doctor. Medical officers have confessed to me that they have found difficulty in knowing when to act the doctor and when the soldier. The general rule is that one should always behave as a doctor when dealing with the sick and at all other times assume the "smart and soldierly bearing" of the regimental officer except in one's own Mess, when it is unnecessary to pose as anything but a gentleman.

One of the most important attributes of the soldier is a sense of discipline. Any medical officer to whom the genuine joys to be obtained therefrom are not already familiar should remember that it entails not only insistence on discipline in others but the preservation of an even higher level of discipline in himself. A medical officer's influence for good will wane rapidly if he is slovenly in dress or unpunctual on parades. As a soldier, also, the medical officer must develop a general knowledge of the tactical use of the unit to which he is attached as well as of the medical tactical aspect of collection and evacuation of casualties.

Further, it is essential in these days of mechanization that he shall be complete master of the art of map-reading and be capable of teaching the art not only of reading but of memorizing a map to bearers and ambulance drivers.

HYGIENE AND SANITATION.

The military surgeon no longer occupies the position of pre-eminence in the medical service of an army to which he was raised by the achievements of men like Ambroise Paré and Larrey. During the past century he has yielded pride of place to the hygienist working through the medium of the regimental medical officer.

One result of this has been that while, during the South African War, fifteen men became casualties from disease for every one actual battle casualty, in the Great War this ratio fell to two to one.

The history of all campaigns from biblical to modern times has shown that where weapons have killed their thousands, tens of thousands have perished from epidemic or preventable disease, and the professional soldier is well aware that the success or failure of any operation may be decided by the standard of health of the troops at his disposal. He rightly esteems the advice of his medical officer highly and is only too anxious to co-operate with him in all that he may suggest with a view to preventing disease and bettering the health, both physical and mental, of officers and men.

To this end it is the important duty of the medical officer to obtain the most intimate knowledge of all details of the life of the men under his

medical charge while on or off duty and during day and night. The word "hygiene" covers not only the unsavoury latrine and drain but ventilation, the supervision of water supplies, dietetics and cookery, general and personal cleanliness, hours of duty, clothing and protection from the elements, morale, and a host of other details too numerous to mention. Not only will the student be faced with the relatively unfamiliar preventive aspects of the ordinary diseases at home but he may at any time be sent abroad where certain types of tropical diseases will loom large on his horizon. It is not enough for him to have a superficial acquaintance with the diagnosis and treatment of malaria, for instance, but he must also know how the disease is spread, the life history and habits of the anopheles, the methods of extermination of mosquitoes and the measures of personal protection available for the men under his charge, such as nets, sprays, anti-mosquito cream, etc.

Further, the louse does not greatly interest the student in civil practice while in the Army the creature assumes great importance. It is apt to be almost universal and is the carrier of many diseases such as typhus, trench fever and relapsing fever. The medical officer must know about the prevention of infestation and when and through what channels clean clothes, baths and facilities for disinfestation of clothing may be obtained.

He must indeed become master of many subjects not on the surface related to medicine but nevertheless of prime importance in the prevention of disease.

It will easily be realized that within his unit a medical officer occupies a position of power and responsibility often greatly in excess of his comparatively junior rank. Slackness will not only affect adversely the health of his own men but may form the starting point of infectious disease which, by spreading through other units, will diminish the striking power of the Army to a serious extent. There are no short-cuts to hygiene and one may quote the words of Sir Stanley Maude relative to the scourge of dysentery in Gallipoli: "It is not development in preventive medical work but rather greater efficiency in the manner in which the existing system is carried out that is required."

It would take long to cover these matters in detail but two problems of special importance at the moment should receive mention. I refer to ventilation and water supplies.

VENTILATION.

With the return of large numbers of troops to this country as a garrison and the difficulty of ensuring adequate ventilation at night owing to the necessity for black-out regulations the droplet-spread group of diseases is assuming a position of outstanding importance, especially, of course, during the winter months.

Attention to spacing of beds in huts and billets so as to remove "heads" as far as possible from each other is important.

Under war conditions no soldier's head should be less than 5 feet from

that of the next and each man should be allowed a minimum of 45 square feet of floor space.

The method of "double bunking," by which bunks are built in pairs or in fours, may be used in rooms where there is sufficient ceiling height, and this will economize accommodation without reducing the distance between heads.

This entails, however, especial care over ventilation and is certainly not to be used light-heartedly as a means of cramming more men into billets when accommodation is hard to come by.

There has been a considerable outbreak of cerebrospinal fever in this country during the winter, no doubt partly attributable to under-ventilation and overcrowding in some areas owing to shift of population and to a rising carrier rate in the country, and it is of some interest to note that the Army at home was not more seriously involved than the civil populace. This is the reverse of previous experiences where this disease occurred especially as epidemics in barracks or hutted camps. The comparatively light incidence in troops must be attributed to the careful enforcement by medical officers of regulations drawn up by the Directorate of Hygiene with a view to preventing overcrowding and to ensuring night-time ventilation of huts so far as is humanly possible. In a Division of some 17,000 men, for instance, only three cases occurred, all of whom were infected while on leave in their own homes.

There is, however, every reason to expect that the problem will be even more acute in the future owing to the increased number of troops now at home and the very greatest vigilance will be necessary on the part of all medical officers not only from the preventive aspect but to ensure the early diagnosis which is of such supreme importance if the excellent therapeutic results of the sulphonamide group of drugs in this disease are to be fully exploited.

The incidence of the common cold, influenza, tonsillitis and infantile paralysis, spreading by the same means, will respond similarly to these precautions.

WATER SUPPLIES.

With the occurrence of several outbreaks of the enteric diseases in this country shortly before the war, it has come to be realized that our water supplies cannot all be trusted to the extent we were accustomed to believe, and this is of course true especially of country supplies and wells. Many municipalities now undertake routine chlorination of their supplies. Because a farming community has used a well supply for a long time without trouble does not mean that urban dwellers now in the Army can drink the same water with impunity. Measures are now being taken for all non-municipal sources of supply to the Army to be chlorinated and this will entail a detailed knowledge of water duties by all medical officers, including familiarity with the various forms of apparatus they may be called on to use, such as

water-tank trucks, trailers and portable filters, as well as with the methods of water purification applied to various forms of containers from large tanks to the individual soldier's water bottle.

CASUALTIES.

The normal organization for the collection and evacuation of casualties *via* the regimental stretcher-bearers, field ambulance and motor ambulance convoy is fully described in the manuals and it will function in case of hostile landing in this country. It will be found, however, unsuitable for casualties due to hostile air action and a few words on this subject are necessary.

It has been laid down that in case of air attack resulting in numbers of casualties, Army and civil medical services will be pooled. This means that the medical officer will have to deal with civil casualties as well as military if they occur in his immediate neighbourhood but it also entails the use of the civil services for military casualties. Casualties will in all probability be admitted to the most convenient civil hospital under the Emergency Medical Services Scheme.

The main problem is likely to be one of transport. It may be that an Army ambulance car will be readily available but possibly there will not be one and evacuation will then depend on the civil ambulance services. The number of these and their availability will naturally vary in different areas and improvised transport may have to be used instead.

It is necessary, however, to emphasize and re-emphasize that the one thing which really matters to a wounded man is the rapidity with which he can be admitted to a surgically-equipped hospital. This is the most important thing a medical officer must think of in relation to his casualties. For this reason he should arrange, where possible, to have his casualties taken direct to hospital without stopping at any civilian first-aid post. The best method of transport is that most rapidly available, provided of course it is suitable to the casualty involved.

While no medical man can underestimate the value and importance of skilled first-aid work, it is quite possible under home-service conditions for undue insistence on first-aid to interfere with and delay the primary and essential consideration of rapidity in evacuation. Almost the only things which should be allowed to delay an ambulance are the necessity for stopping urgent hæmorrhage and the need for splinting fractures.

It is one of the important functions of the medical officer to teach every man in the unit the use of the first field-dressing and to train a proportion, which should be as large as possible, as regimental stretcher-bearers for the collection of wounded and first-aid work. He should not allow the weeds and the defectives to be allotted to him for this purpose. It takes a strong man to carry a heavily loaded stretcher any distance and a very intelligent one to render useful first aid.

In teaching first aid certain important points should be remembered. The tourniquet is a dangerous weapon and predisposes greatly to the fatal wound infections. It should, if possible, be used only by the medical officer. If, as may happen, it is necessary for the bearer to apply it, he should understand that the case must be seen by a medical officer at the earliest possible moment. The tourniquet has lost more limbs and lives than it has saved.

During an enforced wait for an ambulance car, cover from the elements and, where possible, from further attack, and rest for the injured man will naturally be provided and the treatment of shock by warmth, hot sweet drinks, and morphine where indicated commenced. In this connexion a word of warning should be given in relation to warming-up shocked patients. Overheating is as harmful as underheating, and one of the most certain methods of jeopardizing a shocked patient is to cause further loss of fluid by sweating. The method of applying warmth by supporting the stretcher on trestles and placing a Primus stove beneath may quite easily be overdone, just as may be the case with the electric shock-cage in hospital. The correct temperature to aim at around the skin surface is one slightly below blood heat.

The splinting of fractures is the third important part of first aid. We are all familiar with the striking diminution of mortality from shock in compound fractures of the femur which resulted from the introduction of the Thomas splint during the last war. It is really important that bearers should be able to apply this splint effectively and also that they should be capable of improvising splintage for a fractured limb when the Thomas splint is not available.

Finally the medical officer has an extremely important function to fulfil in classifying the wounded in order of priority for evacuation. It is useless to occupy transport by the dead and the mortally wounded and it is bad organization to send slight injuries to hospital before severe ones. It is the medical officer's bounden duty to see that cases of urgent hæmorrhage, open thoracic wounds, abdominal wounds and compound fractures arrive at hospital first. Whenever possible, also, the hospital concerned should be warned of the arrival of any cases which may need immediate operative treatment.

A field medical card must be attached to each casualty with a description of his injuries and what treatment has been applied and even in the hurry of the moment a record of casualties must be kept in the admission and discharge book.

The whole problem of evacuation at the moment is one of close co-operation with the civil services in the area. The medical officer should get to know the responsible A.R.P. control officers and draw up a detailed scheme for his unit, so that every officer and man knows what to do and where to apply in the case of casualties. Unless he does his thinking beforehand there is no chance of evacuation passing off smoothly.

REHABILITATION OF RECRUITS.

Under present conditions recruits may be taken directly into some units without preliminary training. They may arrive in mufti and it is the function of the medical officer to conduct an immediate inspection of these men and to segregate any cases of transmissible disease. Thereafter, it is necessary for him to watch the physical progress of any men who are below standard or undernourished and who require a period of good food and graduated exercise before they can be thrown straight into full work. Attention to these men will fully repay the time and trouble taken and it is astonishing to watch weedy men who would otherwise break down fill out and turn into strapping soldiers in a few weeks.

While on the subject of physical fitness it should be mentioned that the fitness of the medical officer himself should not be neglected. He must be able to undertake the thirty-mile route march that is expected of the men even in these days of mechanization and be able at the end of the day to assist in laying out a camp, arranging for water supplies and so forth.

To this end the medical officer should take pains to enter into physical training and organized games along with other members of the unit.

RECORDS AND RETURNS.

I do not propose to inflict upon you details of the many returns which are required. As a profession we do not take kindly to paperwork but it should be remembered that Army Returns are really necessary for the information of Divisional and Corps Staffs and for the War Office. All statistics and estimates of the prevalence of disease are based on those returns and if they are inaccurate a false impression will be gained by the responsible authorities.

Especial mention is necessary of the use of the admission and discharge book as this may form the sole evidence at a later date in respect of a soldier's claim for a pension.

The sanitary diary is a day-to-day record of observations by the medical officer on matters affecting the health of the troops and should be regularly used and as regularly presented to the officer commanding for perusal and signature. It serves a valuable purpose in throwing the responsibility for action on medical advice on to the combatant branch to whom it properly belongs.

Furthermore, such records of the soldier as the medical history sheet must be kept up. To take an example, it benefits no one for a medical officer to inoculate a man against typhoid and paratyphoid and yet fail to enter the fact on medical history sheet and paybook. The next medical officer under whom the soldier comes has no idea whether the inoculation has been carried out and is forced to be on the safe side and re-inoculate. Even the soldier concerned is unlikely to forgive the omission.

Quite apart from statistics required for the conduct of operations the

returns obtained from the medical services will form the basis for the statistical section of the history of the war.

If anyone has the slightest doubt of the value of these statistics as a piece of mass research work, I recommend perusal of the final volume of the "History of the Great War." Not only can the reader find therein information of the greatest professional interest but this volume furnishes for the first time in the history of the British Army standards upon which estimates for the medical conduct of this and future wars can be based by the staff officers concerned.

Any medical officer who is so devoid of conscience as to prejudice the accuracy of this fine piece of research fully deserves the retribution which will assuredly overtake him.

ECONOMY.

One might imagine that talks on Economy come more within the province of the B.B.C. than of the Army but, in practice, it will be found that the economy and salvage drive is a very real thing in the Services and the medical officer is not only expected to assist in checking waste in cook-houses but also to ensure economy of medical stores.

The medical officer is issued with a set of equipment which is quite sufficient for this purpose. It is, however, generally expected that he will report for duty with the essential personal equipment which every doctor is expected to possess, no matter where he is; for instance, a stethoscope, sphygmomanometer, clinical thermometer and hypodermic syringe.

The first measure of economy is to avoid indenting for fancy drugs. Anything can be supplied within reason, but fancy prescribing, seldom therapeutic in civil practice, is totally wasteful when applied to the soldier. One or two simple mixtures, a series of essential drugs in tablet form, a hypodermic and some morphine, atropine and adrenalin will go a very long way.

Please remember that the medical officer is personally responsible for all medical equipment and if anything is lost he will pay for it. For this reason he should never take anything on charge without checking it carefully and giving a signed receipt for it, obtaining a similar receipt from his successor when he hands it over again. By this means he will avoid paying for equipment that someone else has "scrounged."

A careful eye must be kept on what happens to drugs and dressings. It goes without saying that dangerous drugs and brandy will be kept under lock and key and accounted for as they are expended; but triangular bandages are apt to find their way into the ambulance drivers' hands as grease-rags while the strange places in which one meets elastoplast adhesive must be seen to be believed. Elastoplast is expensive and is issued almost solely for the treatment of blistered feet and not for repairing the wireless of the sergeants' mess. Ordinary adhesive strapping will do for other purposes. As a taxpayer the medical officer is paying for material used and it is well that he should be extremely careful of it.

If a medical officer ever feels inclined to complain about his lot, he should remember that the majority of his colleagues in the combatant branches are totally divorced from their civil profession for the duration of the war, while the military doctor not only serves his country in the practice of his own profession but actually has a unique opportunity of adding thereby to his professional value in after-life.

I am indebted to The Director-General, Army Medical Services, for permission to deliver and publish this address.

CLOSED HEAD INJURIES.

BY GROUP CAPTAIN C. P. SYMONDS, D.M., F.R.C.P.,

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THE title of this paper requires a word of explanation. The word "closed" may be used of head injuries in different senses. Here it will cover all cases in which there is no penetration of the dura mater and therefore no direct evidence of injury to the brain. What we want to know in these cases is how severely, and to what extent, the brain has been damaged. The presence of fracture—fissured or depressed—may help us. The latter especially is ground for supposing the subjacent brain to have suffered contusion. The fissured fracture provides less certain evidence of cerebral damage, for it may represent a superficial distribution of the force of impact, but a fissured fracture of the vault at the point of injury must generally mean that the underlying brain is hurt.

There is occasionally evidence of local damage to the brain in the shape of physical signs—dysphasia, hemiparesis, altered reflexes, visual field defect, cranial nerve injury, for example. Routine clinical examination will pick up these clues, especially if carried out regularly in the early stages.

It is, however, remarkable how seldom in the closed injuries clinical evidence of this kind is forthcoming. As a rule the disturbance of cerebral function is of a generalized rather than a localized character, the evidence being disorder of mental function. This is, of course, obvious in the loss of consciousness following head injury and in the states of mental confusion through which the patient passes on his way to recovery. There may also be observed, after the patient has recovered from his confusion, impairment of mental function as clinical evidence of brain injury still persisting.

CLINICAL RECORD OF THE ACUTE STAGE.

It is only within recent years that any serious attempt has been made to analyse and record the symptoms of traumatic mental disorder. The reasons for this are not far to seek. The custom has been that these cases are admitted under the care of the surgeons whose main concern has been to recognize and save those with progressive meningeal hæmorrhage. Attention was therefore focused upon those symptoms which might be considered indicative of operation. The usual record in a case of closed head injury would comprise temperature and respiration charts, a half-hourly or hourly pulse chart for the first twenty-four or forty-eight hours, a note or two stating whether the patient was conscious or unconscious on admission and,

if unconscious, when he became conscious, and some brief record, usually falling a good deal short of neurological standards, of any abnormality detected in the nervous system.

We, in this country, owe a debt to the late Mr. Wilfred Trotter who emphasized the practical importance and opportunity of observing and recording the different states or stages of mental disturbance after head injury and invited the closer attention of neurologists and psychiatrists to the facts and their interpretation. The result has been an increasing tendency towards co-operation between surgeon and neuro-psychiatrist. In point of fact the problems of diagnosis, prognosis and treatment in the closed head injuries are essentially neuro-psychiatric. Surgical intervention is rarely necessary and, when it is required, the earliest indications are to be found in change of mental state or neurological signs.

What should be our criteria for an adequate history of the patient with closed head injury ?

We need in the first place a note of the main facts of the accident, including time and place. These may be of clinical importance later.

Next we want a record of the mental state, as early as possible, from the moment of the accident until the patient recovers clear consciousness. Information about the earliest stages is often difficult to obtain but we can at least note carefully the mental state on admission and thereafter. A detailed description of the patient's behaviour, his reactions to stimuli, his response to commands and questions and his performance with mental tests, will convey this, and is desirable, when time and opportunity offer ; but for practical purposes we want something less elaborate. We need a record which will convey, clearly and quickly, the main facts of the sequence of mental events, in the same kind of way as the temperature, pulse and respiration chart conveys the sequence of certain physical events.

Mental states are, of course, much more complex than physical states and we must begin therefore by defining those groups of symptoms, or syndromes, which are of common occurrence. Up till now those of us who have been specially interested in head injuries have developed each his own definitions and terminology and the result has been a certain amount of confusion. When A receives a patient from B some days after a head injury and reads in the notes that he was unconscious for six hours and subsequently in a state of traumatic stupor for two days, A fails to gain a clear idea of what has occurred unless he happens to know exactly what B means by these terms. It has therefore become apparent that it would be an advantage for all who are concerned with the care of head injuries if they could agree upon a set of definitions for the main features of the traumatic mental state. Under the ægis of the Medical Research Council a committee has accordingly drawn up a short list of such definitions to serve as a glossary. This is intended to be useful for abbreviating description and for facilitating the exchange of observations between different observers.

First on the list is Coma, thus defined : " A state of absolute unconscious-

ness as judged by the absence of any psychologically understandable response (including for example change of expression) to external stimulus or inner need." This definition gives one pause but, once grasped, I think the meaning is clear. A response which is psychologically understandable is something more than physiologically understandable. A response which is psychologically understandable is such because, comparing it with common experience in ourselves and in others, we have a right to conclude that it is associated with a mental process—thought or feeling. To take examples, if I touch a man's cornea and there is an isolated contraction of the eyelids, that is a physiologically understandable response; but if he screws his eyes up, or turns his head away, that is a psychologically understandable response. If I let a spoonful of water run into a man's mouth and after it has reached the back of his tongue it is swallowed, that is physiologically understandable, but if he sips from a spoon full of water put to his lips, that is a psychologically understandable response. If I pinch the sole of his foot and there is simple flexion of one or both lower limbs that is physiological but if he grimaces or cries out or moves to the other side of the bed that is psychological.

There is a note after Coma to the effect that when a patient is comatose we should remember to record the state of reflex activity but warning us not to state of such a patient, who for example has lost his swallowing reflex, that he is "deeply comatose." A patient is either comatose or not. Reflex activity at physiological levels is something to be recorded separately.

The next definition on the list is that of Semi-coma. In view of the statement already made that coma is all or nothing, semi-coma seems inappropriate. It is difficult, however, to find any term more suitable to describe a state which is defined as that in which "psychologically understandable responses are elicited only by painful or other disagreeable stimuli, e.g. pinching the skin, shaking the patient vigorously." At least we all appreciate the reality of this, the lowest state of consciousness, and may agree to call it semi-coma, usefully if illogically.

Next we come to the state of impaired or clouded consciousness called Confusion, "characterized by impaired capacity to think clearly and with customary rapidity and to perceive, respond to, and remember current stimuli." In confusion there is also disorientation for place, time or person.

Three degrees of confusion are recognized. Proceeding from semi-coma towards a higher state of consciousness we may take the *Severe* degree of confusion first. This is defined as a "state in which the patient, though for the most part inaccessible, will occasionally show adequate response to simple commands forcibly given and if necessary reinforced by appropriate gestures, e.g. 'Put out your tongue,' 'Take my hand.'"

Moderate confusion is "a state in which the patient, though out of touch with his surroundings, can be got to give relevant answers to simple questions, such as, 'What do you do?', 'How old are you?', 'Where do you live?'"

Mild confusion is "a state in which the patient, though presenting the

characteristic features of confusion in some degree, is capable of coherent conversation and appropriate behaviour."

These rough divisions correspond with tests which we are all in the habit of applying at the bedside. Nurses and orderlies can be taught to observe and record the first moment at which a patient responds to command or answers question. The diagnosis of mild confusion, however, may require skilled examination. The patient, whose conversation and behaviour are such that his mental state passes for normal in the ward, may be found on careful interrogation to be imperfectly oriented.

Other definitions in the list are of value in the description of the acute stage of closed head injury—for example, *delirium*, which is confusion "with motor restlessness, transient hallucinations and perhaps delusions," and traumatic *stupor*, a state of confusion in which the patient "though not unconscious exhibits little or no spontaneous activity."

Let us take an imaginary case of severe injury and record the mental phenomena in these terms. On admission the patient is in coma and remains so for two hours. He then becomes semi-comatose for the rest of the first twenty-four hours. He passes from this into a state of severe confusion, lasting another twenty-four hours. Following this is a state of moderate confusion lasting two days, and, after this, mild confusion for six days. During the stages of severe and moderate confusion there are periods of delirium and stupor, the delirium occurring usually at night.

The temperature, pulse and respiration chart, together with the positive neurological findings, complete the clinical record.

The neurological signs, when present, are often of a kind which are inconspicuous unless especially looked for. Anosmia is a common example, usually associated with a fall or blow on the back of the head. Inequality of the pupils, nystagmus, an extensor plantar response on one or both sides, are not uncommon findings. Incontinence of fæces or urine should always be recorded together with the time at which control is regained.

Clinical records of this kind are invaluable in the later stages of the case for guidance in treatment and assessment of prognosis. They also serve to indicate the earliest signs of cerebral compression from extradural or subdural hæmorrhage.

INVESTIGATIONS IN THE ACUTE STAGE.

It is always worth while having the patient X-rayed as soon as possible, as soon, that is, as his general condition is such that the necessary disturbance will not harm him and his mental state is sufficiently co-operative to allow good pictures. The presence of a fracture gives evidence of the force of injury; its character and position may point the need for special observation, e.g. a mid-frontal fracture running down to the base will indicate especial watch for cerebrospinal rhinorrhœa. Lumbar puncture is useful for the information it may give but again should be delayed in serious cases where respiration is shallow or uneven or pulse rapid and feeble until

there is improvement in these respects. A bloodstained fluid is informative. It means, as a rule, that there has been subpial hæmorrhage of sufficient extent to rupture into the subarachnoid space. The pressure of the cerebrospinal fluid may also be of value in guiding treatment. It may be raised, normal, or subnormal, without any constant relation of pressure to mental state or physical signs. A high pressure, e.g. 250 mm. or more, is an indication for withdrawal of fluid until a normal pressure level is recorded and probably—depending upon the progress of the case—a further puncture in a day or two. Persistently high pressure associated with severe headache is cause for nursing the patient with his head high and, possibly, for the administration of hypertonic solutions by mouth or rectum, though the benefit of these is transient.

Headache associated with subnormal pressure may occasionally be relieved by raising the foot of the bed on blocks.

Records obtained by the electro-encephalogram are of great interest though it is too early yet to assess their full value. The state of traumatic confusion is usually associated with gross abnormality in the form of large slow waves widely distributed. A similar but circumscribed disturbance is suggestive of a focal lesion. Taken in conjunction with the clinical evidence the gradual return to normal rhythm affords opportunity of observing the restoration of function.

TREATMENT IN THE ACUTE STAGE.

It might go without saying that scalp wounds need prompt and thorough care were it not for the occasional happening of serious complications from neglect of this first principle. Infection of the scalp, especially in the presence of a depressed or fissured fracture, may easily lead to subdural abscess, meningitis, or intracerebral abscess. Examples of such grave sequelæ have been seen in tangential wounds from bullet, bomb or shell fragments, without fracture and indeed in cases so trivial that the patient was not at the time removed from duty. The local impact of such glancing blows may be sufficient to devitalize an area of underlying bone and, beneath this again, cause cerebral contusion so that there is a nidus ready for deep infection. Scalp wounds should therefore be dealt with as soon as possible and on the same lines as wounds in other parts of the body and in cases of compound fracture—depressed or fissured—devitalized bone should be removed.

Mention has been made already of the occasional need for medical decompressive treatment—therapeutic lumbar puncture, raised head, administration of hypertonic solutions. Such measures should be employed only in the light of measurement of pressure by lumbar puncture, never as a routine. Skilled nursing in the severe cases is all important, especially in the states of coma or semi-coma. The complication chiefly to be feared is pneumonia, hypostatic or aspiration. The patient should be nursed on his side and turned four hourly. Fluids should not be given by the mouth in the ordinary way until the ability to swallow has been tested by means of a

few drops of water squeezed from a wet swab. If the swallowing reflex is impaired fluids should be given by nasal tube. This may be left in situ strapped to the forehead for a day or two at a time. It should be remembered that retention of urine may occur in this stage and that a wet bed does not always mean an empty bladder.

A purgative should be given as soon as possible except to patients suffering from shock. A liquid preparation is best, e.g. 2 to 4 drms. of cascara evacuant. This may be administered by the nasal tube if desirable. If necessary this may be followed by an enema and the bowels should be kept open in this way at least once in forty-eight hours. Anything more drastic in the way of purgation is unnecessary and may aggravate restlessness.

The control of restlessness is often difficult in the state of delirium. There is no drug which is both effective and harmless. The trouble with most is that sedation may be followed by increased confusion. Especially is this true of the bromides which are therefore best avoided in large doses. The barbiturates in repeated doses carry the same disadvantage and so does hyoscine. Chloral hydrate in 20 gr. doses with 10 gr. of bromide is sometimes effective and relatively harmless if given six-hourly. Hypodermic injection is an occasional necessity. There are those who object to morphia on account of its depressant effect on the medulla but there are times when nothing else will serve to tide over a crisis. Small doses $\frac{1}{8}$ to $\frac{1}{4}$ gr.—repeated only when necessary to control restlessness—are then justifiable. Skilful nursing should however take the place of drugs as far as possible in securing rest. Noisiness is another matter. It may be necessary on occasion to give a patient with head injury a powerful sedative to stop disturbance in the ward but to continue this is bad practice. The noisy patient should be nursed in a side room or if necessary transferred to a mental hospital for his own sake.

Progressive deterioration in the mental state, or the development of neurological signs, e.g. hemiparesis, unilateral dilated pupil, are the commoner indications of epidural or acute subdural hæmorrhage. They may or may not be associated with a slowing pulse and, it must be remembered, bradycardia may occur in cerebral contusion without meningeal hæmorrhage.

The modern surgical method of exploration through four burr holes, two on each side, anterior and posterior, is so simple and harmless that it is better, if compression from hæmorrhage is suspected, to exclude it than remain in doubt.

It must not, however, be imagined that a rapidly progressive deterioration in the general state of a comatose patient in the first twenty-four hours after injury is an indication for surgical exploration or treatment. There is in any large series a group of these cases with progressively rapid, feeble pulse, increasing rate of respiration, and often a quickly mounting or else a persistently subnormal temperature. When these signs have been associated from the outset with coma they mean that there is extensive

laceration of the brain. Operation will not save these patients, even if the direct injury to the brain is accompanied, as it often is, by epidural or subdural hæmorrhage.

THE AFTERMATH.

We are all familiar with the symptoms encountered after closed head injury. They are often vague, sometimes voluminous, generally subjective. Headache, giddiness and a variety of mental symptoms are the commonest. What are the essentials of the clinical record to be aimed at in these cases? First, of course, analysis of the subjective complaints. Headache which is localized, sharp, intermittent, transient and provoked or aggravated by effort or change of posture, suggests local organic cause. Headache which is continuous, described in terms of discomfort, and unrelated to the causes described above, is usually associated with symptoms of mental disorder.

Giddiness may be described in terms of true vertigo or, more commonly, as a transient disturbance of equilibrium vision and consciousness together—possibly a vasomotor disturbance.

The mental symptoms most frequently are those of affective disorder—depression or anxiety—but with, or apart from, this there may be subjective difficulty in thinking or, on examination, objective evidence of intellectual impairment.

Next we want a record of the earlier symptoms such as has already been described. We shall add to this ourselves, if it has not already been recorded, the duration of retrograde and post-traumatic amnesia as judged from the last memory before the accident and the beginning of continuous memory after it. Neurological examination, supplemented by X-rays, including in some cases a pneumo-encephalogram and electro-encephalogram, is also necessary to bring the story up to date. Examination of the mental state is often of greater importance; behaviour, talk, mood and special pre-occupations, responses to simple tests of memory and calculation, judgment and insight.

But we want more than this if we are to arrive at a fair estimate of prognosis and disposal. We want to know what kind of a head it was before the injury. The most important inquiries relate to evidence of neurosis in the family or personal history, especially a tendency to affective disorder which is so frequently precipitated by head injury, the previous standard of intellectual and personal efficiency as judged by school performance and jobs held and adjustment to service life.

A family or personal history of migraine or epilepsy and a previous history of head injury may also have an important bearing upon prognosis.

PROGNOSIS IN THE LATER STAGES.

In the case of any man who remains unfit for duty six weeks after a closed head injury it pays to sift the evidence as outlined above with a view to prompt decision as to the prognosis. The basis for judgment is

complete neuro-psychiatric examination. The persistence of physical signs should be neither under nor over-rated. Cranial nerve injuries, for example anosmia, may be persistent but not disabling. Fracture of the skull in itself has little prognostic value.

The value of subjective complaints must be measured by observation of behaviour and examination of mental function. In most cases ten days' observation should suffice to decide whether the patient is likely to be fit for return to duty within a reasonable time. The following brief notes on the factors of importance in prognosis may be of value. They are set down in order of importance as they appear to the writer at present :

(1) The pre-traumatic constitution as measured by the family and personal history. The well endowed, well knit, stable personality stands even severe head injury well. A family or personal history which includes a liability to affective disorder, a previous history which indicates an hysterical disposition, a record of poor adaptation to the stresses of ordinary life, a timid, anxious or dependent disposition—these are the features which lead one to expect persistent and often disabling sequelæ. A previous history of severe head injury also is of bad omen even though recovery may appear to have been complete.

(2) Age is the factor probably of next importance. This has been stressed by Ritchie Russell who found in civilian cases that, given approximately the same degree of injury as judged by the early story, the prognosis for return to full work progressively deteriorated over the age of 40. We have recently gained the impression that the age factor begins to count even earlier than this and that the optimum age is 25 or under.

(3) The duration and degree of mental disorder as recorded in the early history of the injury and measured later by the duration of the traumatic amnesia. The duration of the retrograde amnesia taken alone appears to be of especial significance when it is unusually long, e.g. more than a few hours.

(4) The situation arising out of the injury ranks almost of equal importance with the second and third factors. In civil life it is the question of compensation which is often most important. In service cases the comparable issue of return to full duty or something more comfortable may take its place. Separation from friends, loss of promotion, anxiety as to future capacity for service or civilian employment are also common sources of trouble.

These are general principles. In the individual case many other points will arise, for example persistent signs of focal damage, intellectual impairment, or personality disorder on the bad side ; absence of any such evidence on the good side. The general impression of the patient as summed up after ten days' observation is the most important of all. If the recent story is that of improving symptoms and he is ready and willing to accept the prospect of return to duty the outlook is relatively good. A hostile, resentful or despairing attitude which proves unamenable to simple psychotherapy carries the reverse prospect.

DISPOSAL AND TREATMENT.

After ten days' investigation and observation it is possible in most cases seen six or more weeks after injury to decide which should be invalided as unlikely to be fit for any kind of duty within a reasonable time. There will be few exceptions for whom a longer period of observation is needed. For those in whom the outlook is considered good a carefully managed and graduated convalescence is necessary. The basis of treatment, as for sound judgment in disposal, is the complete neuro-psychiatric investigation and record which has been outlined. Most patients in the first place need explanation and reassurance. There is a general tendency to be more anxious about the effects of injury to the head than injury elsewhere. Fears of insanity or of permanent damage to the brain need to be evoked and allayed. The patient needs to be told that headache and giddiness are the common and natural consequences of head injury and may persist for some time though not in disabling degree. He must learn for the sake of his own welfare to make the best of such symptoms while they last. If he is worried by the fact that mental or physical effort tends at first to aggravate symptoms he needs to be told that his state is comparable with that of a man learning to walk after a broken leg. He must expect to go through a phase of awkwardness and discomfort on the way to full recovery of function.

Convalescence from head injury is best managed in a special hospital for the purpose having its own resident medical officer aided by weekly visits by the medical officers who have had charge of the patients in the earlier stages. Such provision exists in connection with the Military Hospital (Head Injuries). Occupational therapy and graduated physical exercises, both under the supervision of trained instructors, organized outdoor recreation and games, and casual recreation, play their part in the plan of treatment. For each man a programme of suitable activity with intervals of rest is arranged with graduated progression to full activity at a rate dependent upon symptoms.

Repetition of explanation and reassurance is often necessary in the earlier stages. It may become evident in the course of convalescence that certain patients will not be fit for full duty on discharge and will need to be boarded to a lower category for the time being. It is a mistake to prolong convalescence unduly. If a patient after a period of three or four weeks appears to be making no progress disposal should be revised.

It has been found that of all patients with closed head injuries admitted to the Military Hospital (Head Injuries), after allowing for those who subsequently relapse, 60 per cent can be returned to duty by these methods.

TRAUMATIC EPILEPSY.

The incidence of traumatic epilepsy for closed head injuries as a whole is very small. It is to be looked out for especially in those whose record

shows a prolonged initial state of confusion, signs of focal damage, or persistent intellectual impairment or personality disorder. A family history of epilepsy or migraine is also of importance. The electro-encephalogram may sometimes detect the liability before it becomes clinically apparent, but a normal electro-encephalogram does not exclude it, in fact the electro-encephalogram may be normal in a patient who is subject to obvious epileptic attacks.

An occasional attack of minor epilepsy in the first few weeks after head injury does not always carry a bad prognosis. The liability may quickly disappear under suitable sedative treatment. The occurrence of such attacks in the early stages is not necessarily therefore cause for invaliding. Traumatic epilepsy of delayed onset—and the latent interval may be one of months or years—has a much worse prognosis.

It is a pleasure to record my indebtedness to Lieutenant-Colonel G. O. Chambers, *M.C.*, and the Medical Officers of the Military Hospital (Head Injuries) for some of the work upon which these notes and observations are based and especially to the Medical Specialists, Major D. E. Denny-Brown and Major W. Ritchie Russell, for their help and criticism.

DIGESTIVE DISORDERS IN THE FORCES.

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THE types of cases seen in the wards and out-patient departments of military hospitals present general variations similar to those found in civil hospitals. Thus rheumatic and respiratory disorders have the usual seasonal fluctuations. On the other hand, conditions such as effort syndrome and general psychological disorders tend to increase temporarily with the periodic intake of recruits. But in our experience in a home hospital during the present war the only cases showing steady addition in numbers comparable with the increasing size of the Army have been those with digestive disorders and, in consequence, we have been struck by their significance in the forces. Our cases have been drawn from all branches of the forces, Navy, Army, Air Force and Women's Auxiliary Services. However, Army patients have constituted an overwhelming majority. It was noted that, over a period of fourteen months in a military hospital in a north-western area, of 790 medical in-patients, 246 (approximately 31·1 per cent) were admitted on account of gastro-intestinal complaints; while in a north-eastern hospital it was found that of 980 medical admissions, 353 (36 per cent) were gastro-intestinal cases, but it must be borne in mind that these hospitals are used largely for the investigation of such cases which are especially sent for this purpose and consequently the percentage of gastro-intestinal conditions admitted is not a measure of their incidence in all hospitals. Nevertheless, gastric disorders are an important problem in the Services.

METHODS OF INVESTIGATION AND TREATMENT.

In a large military hospital in a north-western area our procedure in assessing cases of gastro-intestinal disorder is to obtain an accurate case history, followed by detailed clinical examination, and certain lines of special investigation are then undertaken. In what we may term the "gastric" group, which includes cases of gastritis in addition to those of peptic ulcer, tests for occult blood in the stools are performed after seventy-two to ninety-six hours on a hæmoglobin and chlorophyll-free diet. This is followed in many instances by a fractional test meal. Finally an X-ray examination by barium meal is carried out in all save a very few where positive findings are readily obtainable from recent investigation in civil life. Where the gall-bladder or large bowel appears to be implicated, cholecystography or barium enema is carried out.

With the gastric group the dietetic treatment as outlined by Hurst (1931) is employed with excellent results. By this method dietetic principles in treating peptic ulcer are followed, viz. physical rest is combined with a well-balanced diet of an adequate caloric value and vitamin content.

Table I shows the proportions of major types of digestive disorder admitted to this military hospital and their age incidence. At once it is seen that cases of peptic ulcer form the major problem among the dyspepsias, accounting for actually 64·6 per cent of such patients. No attempt has been made to study the incidence of dyspepsia in the various branches of the forces, or to examine sex-incidence, since this would be of no value with the figures at our disposal. It was found that there were four main groups of digestive disorder; duodenal ulcer (54·5 per cent), gastric ulcer (9·75 per cent), gastritis (24·5 per cent), and miscellaneous dyspepsias (11·25 per cent). In this last group psychological disorders appeared to play a relatively unimportant part and we were struck by the rarity of malingering. In our series there were no fatalities.

TABLE I.—AGE INCIDENCE IN MAJOR DYSPEPSIA.

	Under 20	20-29	30-39	40-49	50 +	TOTAL CASES
Duodenal Ulcer	3	52	49	27	4	135
Gastric Ulcer including one Stomal Ulcer	—	5	10	7	1	23
Gastritis	1	22	19	13	5	60

By the addition of 28 cases of miscellaneous dyspepsias a total is reached of 246 consecutive admissions on account of digestive disorders. There were 790 medical admissions in all during the fourteen-month period under review.

DUODENAL ULCER.

Duodenal ulcer formed 85·5 per cent of the cases of peptic ulcer. Fourteen were in officers, the remainder in other ranks. There were no female cases. Perforation had occurred in civil life in four instances and in a fifth shortly after embodiment. In eight patients gastro-enterostomy had been performed and in eighteen appendicectomy. There was a history of either hæmatemesis or melæna, or both, in five patients previously to and in a similar number after entering the forces. The average duration of symptoms was seven years, and only five patients (3·7 per cent of total cases of duodenal ulcer) stated that indigestion occurred first after embodiment. The stool was found to be positive for occult blood in 80 per cent of cases. Fractional test meals were carried out in many instances (see Table II). The results are in keeping with those usually found, viz. the majority of such cases show a well-marked hyperchlorhydria.

TABLE II.—TEST MEAL FINDINGS.

	Achlor- hydria	Hypochlor- hydria	Normal	Hyperchlor- hydria	TOTAL CASES
Duodenal Ulcer ..	—	2	20	26	48
Gastric Ulcer ..	1	3	3	1	8
Gastritis ..	11	15	17	12	55
Miscellaneous ..	1	4	6	1	12

A barium meal examination was carried out and an ulcer niche or distortion of the duodenum was noted in all but one case in whom, although the X-ray findings were negative, an acute ulcer was diagnosed. (In this man an active ulcer had been noted at a previous examination in 1937, the stool was strongly positive for occult blood and in addition a marked hyperchlorhydria was present.) Our well marked positive findings can be explained on the fact, noted above, that the average duration of symptoms in our series was seven years. Moreover in over 96 per cent of the cases exacerbation of a chronic ulcer was dealt with. Recrudescence of symptoms occurred rapidly after enlistment, within two months in 70 per cent and in the remainder within eight months.

GASTRIC ULCER.

The cases of gastric ulcer numbered 23, roughly 14 per cent of the peptic ulcer total. Fifteen had lesser curvature ulcers, the remainder were prepyloric. There were two officers and no female cases. Two perforations occurred in this group, one prior to the war and one after. There was a history of hæmatemesis in three patients before enlistment, with recurrence in one instance two months after embodiment. In one man included in this group gastro-enterostomy had been performed on account of duodenal ulceration with subsequent development of a stomal ulcer. Appendicectomy had been previously undertaken in two patients.

With the exception of four patients, approximately 18 per cent, there was a history of digestive trouble in civil life, the average duration of symptoms being five and a half years. The situation of the ulcer did not affect this last point. The stool was found to be positive for occult blood in 66 per cent of the cases. The results obtained from fractional test meals, while too few to draw any general conclusion, show a rather lower acidity than in the duodenal group. This is explained by the greater irritation of the gastric ulcer resulting in concomitant gastritis and consequent overproduction of mucus (Hurst, 1935). A barium meal showed an ulcer niche in all but two instances. This examination was carried out within ten to fourteen days of admission to hospital since it was of the highest importance to obtain radiological evidence of the presence of ulcer for purposes of the consequent medical boards. As has been noted by several observers, the ulcer niche in the gastric mucosa may cease to be visualized after three to four weeks with adequate treatment (Hurst and Stewart, 1929; also Hurst and Ryle, 1937). As with the cases of duodenal ulcer, relapse after embodiment occurred within periods varying between a few days to two months in the bulk of cases, but a few had remained well for periods up to seven months after enlistment.

DISPOSAL OF CASES OF PEPTIC ULCER.

Where investigation had revealed the definite presence of peptic ulceration every patient was brought before a medical board. All cases apart

from officers were found to be unfit for any form of military service, with the exception of one man suffering from gastric ulcer who was passed as fit for home service only. Commissioned ranks, for reasons to be stated later, were dealt with differently. Of fourteen officers showing duodenal ulcers, five were passed as fit for home service only, the others being returned to civil life. One of the two officers with gastric ulceration was graded as fit for home service only, the other was passed fit for general service.

In the last case there were symptoms of indigestion for some four months with loss of weight. He was admitted to another hospital where laparotomy was performed. A mass noted as "either malignant or inflammatory" was observed in the posterior pyloric region, extending into the duodenum. Gastro-enterostomy was performed and the abdomen closed. He came under our care about four months afterwards, in excellent health, gaining in weight and symptomless. The stool was negative for occult blood. Fractional test meal showed normal findings and on two occasions the barium meal examination visualized a normally filled stomach and a functioning stoma. The Kahn test was negative.

GASTRITIS.

Sixty patients, almost 25 per cent of the dyspepsias and therefore an important moiety, were diagnosed as suffering from gastritis. Many of them gave a history of pain and vomiting after food which was so typical of peptic ulcer that the results of barium meals and fractional gastric analyses formed essential parts of the diagnostic criteria. We have adhered to the views of Hurst (1935) in assessing these cases, and the test meal findings in Table II show that great variations in acidity occur in such conditions. Abundant mucus was present, especially in the fasting juice. The great majority (79 per cent) suffered from exacerbation of a chronic gastritis, there being a history of indigestion of several years' duration (average seven years). The remainder gave no history of gastric trouble in civil life and were examples of acute gastritis due to alteration in diet following embodiment.

There were four cases in commissioned ranks; the others occurred among N.C.O.s and men, with the addition of one in a member of the A.T.S.—our only female case. Thirty-one complained of symptoms occurring rapidly after embodiment and the remainder were able to carry on for periods up to one year. A weak positive result for faecal occult blood was obtained in 25 per cent of all cases of gastritis.

DISPOSAL OF PATIENTS WITH GASTRITIS.

All save two cases in this series did well and were returned to their units, in some instances via a convalescent home. It was explained to these patients that they did not suffer from any serious digestive ailment, such as an ulcer and they were instructed to avoid particularly "heavy" constituents in their Army diet. In one instance, a man aged 49 was returned

to civil life owing to absence of improvement (he had achlorhydria); a second was dealt with similarly on account of a concomitant hand injury which interfered with his duties and superadded a psychological element.

MISCELLANEOUS GROUP.

A miscellaneous assortment of gastro-intestinal troubles composed the remaining cases of dyspepsia and accounted for only 11·25 per cent (28 cases). They were made up as follows: abdominal adhesions 6 cases, catarrhal jaundice 5, chronic cholecystitis 2, cirrhosis of liver 1, duodenal diverticulum 1, gastric carcinoma 1, gastro-enteritis 5, mucous colitis, spastic colon group 6 and one example of gastro-intestinal supersensitiveness. In this series four cases were female. Seven of these patients were returned to civil life while two were found fit for home service only. The large proportion of these cases boarded out of the Army is not of real significance owing to the small total number involved.

The patient showing gastro-intestinal supersensitiveness is of interest. A gunner, aged 44, was admitted with a history of hæmatemesis. He stated that he seldom suffered from gastric symptoms in civil life but since embodiment had been seized frequently with severe abdominal pain accompanied by vomiting. He blamed the mid-day meal. On admission, although the stool contained occult blood, he stated that he felt perfectly well and wished to return to his unit. A fractional test meal gave normal findings and a barium meal examination did not reveal evidence of either gastric or duodenal ulcer. The stool was tested after another seven days and was negative. At this point he was placed on Hurst's diet for peptic ulcer, Stage 2, and on irregular occasions complained of severe epigastric pain and vomited after meals. It was suspected that one dealt in this instance with an example of supersensitiveness to a particular food, and the offending article—carrot—was detected and eliminated from his meals with rapid and complete cure. He then stated that he always avoided this vegetable at home because he did not like it.

SUMMARY OF A REVIEW OF DIGESTIVE DISORDERS SEEN IN A NORTH-EASTERN MILITARY HOSPITAL.

During the period April—October, 1940, it was found that of 980 medical cases in a north-eastern hospital, 353 (36 per cent) were admitted for radiological investigation on account of digestive complaints. In just over half the X-ray findings were negative. The majority of patients in this radiologically negative group suffered from gastritis but 22 per cent showed an anxiety neurosis of some form or another. Where there were positive X-ray findings, duodenal ulcers were found to be nine times as common as gastric. Of the cases proved to have ulcer, twenty-one gave a history of operation for perforation. Twenty-three had undergone gastro-enterostomy, and twenty-one gave a history of hæmatemesis (i.e. 15·8 per cent

of cases of proved ulcer). Of the 353 cases under review, fifty-six had previously undergone appendicectomy. 54 per cent of the cases examined by barium meals were found unfit for further military service by medical boards. The mortality in the whole series was nil. Accordingly these results are in substantial agreement with those in the north-western hospital.

DISCUSSION.

The miscellaneous group of gastro-intestinal troubles which make up only 11.25 per cent of our series, consisting of hepatic and colonic disturbances, tumours, etc., have already been described. Nothing more need be written about them as the purpose of this paper is to draw attention to the problem presented by dyspepsia due to ulceration or gastritis.

There seems little doubt that digestive disturbances, particularly those due to peptic ulcer, have increased enormously during the past twenty years. This has been noted with concern in other countries, notably in the United States (Hinton 1933, Wolfert 1937, Rivers and Ferreira 1938). The magnitude and importance of the increasing incidence of peptic ulcer has been brought sharply to the notice of the medical profession during the present war and it has been shown to be a major cause of sickness among our forces.

Willcox (1940) found that in a British convoy from France which contained 174 medical sick, 23.5 per cent suffered from the dyspepsias. This group after investigation revealed the unexpected incidence of peptic ulcer of approximately 66 per cent. Again Morris (1940) noted that of 500 officers and men suffering from dyspepsia and examined radiologically in a military hospital 45 per cent suffered from either duodenal or gastric ulcer or both. Recently Payne and Newman (1940) carried out an important investigation into the subject of dyspepsia in the Army and found in 287 cases that peptic ulcer was proved in 226 (78.7 per cent) and to this they added a further 21 cases (7.3 per cent) with probable ulcer. No significant difference was found on separating these cases into groups from the United Kingdom and France.

In our own series of 246 cases with gastro-intestinal complaints, peptic ulcer was present in 64 per cent, while cases of duodenal ulcer made up 85.5 per cent of the latter. This significant fact was also noted by the authors quoted above. These patients, whether they suffered from duodenal or gastric ulcer, almost without exception were in the habit of carrying out a dietetic regime in civil life which approximated to the post-ulcer regime used at the present day and with success as long as they adhered to it. This is a striking tribute to the efficacy of the medical treatment of peptic ulcer where we find large numbers of patients pursuing their vocation efficiently and with little interruption. In this connection it was pointed out by Colonel H. Letheby Tidy in his Harveian oration (1936) that gastric ulcer is a more serious condition than duodenal ulcer but he concluded that the outlook as regards complete cure was unfavourable in both.

Where breakdown did not occur until some months after embodiment the

majority belonged to older age groups or were in situations where it was possible to obtain suitable food. Such patients often stated that they purchased meals at the local canteen, especially the midday meal, trying to avoid stews which they dreaded. Moreover they were able to treat themselves with alkaline powders usually of some much advertised brand. Similarly, since a suitable diet was a less serious problem, commissioned ranks were sometimes able to carry on for periods up to a year before exacerbation of symptoms occurred. Officers were often able to carry on in comfort in France until active hostilities precluded suitable diet. In this connection the severe physical strain and irregular meals prior to evacuation undoubtedly had an adverse effect. This was also noted in patients after the Norwegian campaign.

A feature in our cases is the general absence of severe complications. Thus, we find in the duodenal ulcer group (135 patients) no history of perforation and only five cases (approximately 3·7 per cent) of hæmatemesis occurring while serving with the forces. During the period under review our surgical colleague, Lieutenant-Colonel E. G. Gerstenberg, R.A.M.C., admitted two cases of perforation and in both a chronic ulcer of the anterior duodenal wall was found. In our gastric ulcer group there was but one instance of perforation after embodiment and one of hæmatemesis. On the other hand, Hurst and Ryle (1937) have stated that some 30 per cent of ulcer patients in private show bleeding at one time or another. Graham, Alexander and Kerr (1939) found over a ten-year period that approximately 57 per cent of the cases of peptic ulcer in a civil hospital were admitted on account of active bleeding. Such marked discrepancy is probably accounted for by two factors. Firstly, cases of ulcer which are showing evidence of activity are unlikely to be passed as fit by the civil recruiting boards and secondly in the Army sufferers go sick and receive treatment earlier than in civil life. The high proportion of ulcer cases with occult blood present in the stool suggests that but for the discovery of this, gross bleeding might have become an important problem.

We were unable to obtain any convincing evidence of serious avitaminosis nor was dental sepsis a more prominent feature in such cases than in other medical admissions. It is, of course, acknowledged that the patient who lost his dentures through vomiting over the side of a transport while returning from Norway was worse after this experience.

In civil life many of these patients led a regular existence suited to their trouble. They seldom admitted that heavy smoking or alcohol played any part in their breakdown; indeed we were struck by the number who stated that they were teetotal and never smoked more than ten cigarettes daily. Embodiment brought these men new problems, worry, the adjustment and strain of taking up a fresh mode of life and leaving their family or business. Altered conditions of living, lack of sleep, unsuitable billets, all affect such subjects adversely. Lastly, the Army diet is not suitable for persons who show the ulcer diathesis. The official decision to discharge

men with active ulcers, or with a history of long-standing severe gastric illness, is of proved wisdom under the conditions of modern warfare.

Patients suffering from exacerbation of chronic gastritis, although they ascribed some improvement in their condition in civil life to the avoidance of such foods as fries, stews and pastries, did not as a class receive the same amount of benefit from a dietetic regime and were more introspective. As was found in the cases of peptic ulcer, and for similar reasons, the group who broke down under several months after embodiment occurred mainly among the older men. It has been noted already that only two of the sixty cases in our series required to be discharged from the Service.

All cases of acute gastritis without previous history made a rapid recovery and returned to their units well. The numbers of this type actually admitted to hospital are of course small since the regimental medical officer is able in the vast majority of instances to deal with them himself. Thus it is seen, almost without exception, that cases with gastritis, both chronic and recent, when given a fresh start and some general dietetic principles to go on can safely be allowed to remain in the Army without alteration in category.

The high incidence of digestive disorders, particularly of duodenal ulcers, seen in the past two decades has been thrown into sharp relief by the mobilization of our man-power for war. It would occasion little surprise if the quickening tempo of modern life were found to have a direct bearing on the problem presented by the increasing occurrence of the dyspepsias. No entirely convincing clue to this enigma has yet been offered but it will be interesting to learn whether or not life in our forces is adding significantly to the already high frequency of such disorders. Final judgment on this point must, of course, await the conclusion of the present conflict. We are in entire agreement with the writer of the leading article in the *British Medical Journal*, of December 14, 1940, who states that "the Army still marches on its stomach even though it travels in mechanized vehicles," and the dyspeptic passenger must be carefully scrutinized before taking part in the journey.

SUMMARY AND CONCLUSIONS.

(1) In Army medicine, digestive disorders are presenting a large and increasing problem. Of 790 medical in-patients, 246 (31 per cent) were admitted to a military hospital on account of gastro-intestinal complaints.

(2) The methods of investigation and treatment of dyspeptic patients in a large military hospital are outlined.

(3) Of 246 cases of digestive disorder, 135 (54.5 per cent) were found to have duodenal ulcers, 23 (9.75 per cent) had gastric ulcers, 60 (24.5 per cent) gastritis and 28 (11.25 per cent) miscellaneous dyspepsia. Details are given of the clinical findings in these groups and of the ultimate disposal of the patients. A review of 353 similar cases admitted for radiological investigation to another military hospital yielded substantially similar results.

(4) Many observers have shown that peptic ulcer is the major cause of sickness among the forces. In our series 64 per cent were proved to have peptic ulcer, cases with duodenal ulcer making up 85 per cent of this group.

(5) Complications such as hæmatemesis and perforation were conspicuous by their rarity.

(6) In the vast majority of ulcer patients we were dealing with an exacerbation of an old-standing condition which was adequately dealt with in civil life by simple medical treatment, enabling the sufferer to continue as a useful member of the community. But the strain of Army life tends to induce recrudescence.

(7) Cases of acute gastritis can often be adequately treated by their own medical officers while men with either acute or chronic gastritis, if given a fresh start by a period of residence in hospital, generally do well and can safely be allowed to remain in the Army.

(8) It is suggested that the quickening tempo of modern life is related to the increasing occurrence of the dyspepsias, especially peptic ulceration, and the question is raised whether or not Army life will add to the frequency of such disorders.

(9) The point of highest military importance which emerges from this investigation is the large proportion of those with a definite history of peptic ulcer, who on embodiment in the Army soon become a serious charge on the medical authorities.

ACKNOWLEDGMENTS.

Our grateful thanks are due to Professor C. H. Browning, for helpful advice and criticism, and to Colonel D. F. Mackenzie, *D.S.O.*, late R.A.M.C., Colonel R. A. Lennie, *T.D.*, late R.A.M.C., and Lieutenant-Colonel A. M. Simson, R.A.M.C., for permission to carry out this work. We also wish to express our gratitude to the pathological and radiological staffs concerned, and to those who have so loyally co-operated in the ward work.

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THE VALUE OF LOW SPINAL BLOCK (LUMBO-SACRAL) ANALGESIA IN THE TREATMENT OF SHOCK ASSOCIATED WITH WOUNDS OF THE LOWER EXTREMITIES.

BY MAJOR A. KERR BOYLE, M.D., D.A.,

Royal Army Medical Corps.

PAIN is an important factor in the initiation and maintenance of traumatic shock. The clinical value of morphine and allied alkaloids in this condition is well known. They exert their beneficial effects by their cerebral depressant action. They do not, however, stem the flow of nociceptive impulses from the traumatized area and the peripheral nerves are affected hardly at all. Spinal analgesia will definitely block these afferent stimuli. In wounds of the lower extremities associated with shock where there has been no great loss of fluid—blood or plasma—and where the pain factor is undoubtedly of great importance lumbo-sacral analgesia, achieved by the subarachnoid injection of a hyperbaric solution such as percaïne heavy spinal solution, 1 : 200 percaïne in hyperbaric 6 per cent glucose solution (Ciba), blocks all traumatic stimulation and improves the clinical condition of the patient. The fall of blood-pressure occasioned by lumbo-sacral analgesia is negligible, the rise of blood-pressure consequent upon interruption of pain impulses from the traumatized area is considerable. The subarachnoid block confined to the lumbo-sacral nerves should be undertaken at the earliest possible moment.

Preparatory local analgesia is carried out using 3 c.c. of a percaïne-ephedrine mixture containing one grain of ephedrine. The temperature of the percaïne solution when injected intrathecally should be about 100° F. The dose required is never greater than 1.5 c.c. There are two apparent objections :

(1) The difficulty of performing lumbar puncture on patients with wounds of the lower extremities who cannot sit up. The sitting-up position is not absolutely necessary. The lateral position with the patient turned on to the side of the injured limb and his head flexed on his chest will suffice. A hypodermic injection of morphine (if this has not already been given) immediately on admission will make things comparatively easy within a short time. After the subarachnoid injection of the percaïne solution the patient is placed on his back with one small pillow under his head. The Trendelenburg position is not adopted. The results obtained from the spinal block make a Trendelenburg position unnecessary as far as the shock is concerned. (2) The danger of infection. Provided there is no possibly or probably infected wound and no local sepsis in the region of the proposed lumbar puncture, i.e. between the spinous processes of the second and third lumbar vertebræ, provided the "anæsthetist" prepares himself as carefully as a surgeon does before operating, provided the "apparatus" required is

sterile and provided the patient's back is cleansed with spirit and painted with iodine before the lumbar puncture, the danger of introducing infection into the vertebral canal is, for all practical purposes, non-existent.

With heavy percaïne lumbo-sacral analgesia the condition of patients with wounds of the lower extremities associated with shock with no great fluid loss is improved. Their preparation for operation can be effected with no delay and certainly with no further shock. Whatever surgical procedures are necessary can be carried out under the existing analgesia (which will last for at least ninety minutes) just as soon as the necessary preparation has been completed. When the operation is about to begin, 5 to 7 c.c. pentothal sodium, 5 per cent solution, intravenously will secure a safe and pleasant narcosis which will probably outlast the operation. If not, a further 3 to 5 c.c. pentothal sodium solution may be given into a vein when required. Damaged tissues can thus be dealt with in the shortest possible time and under the best operating conditions.

Where, in cases of wounding of the lower extremities, large losses of fluid have occurred before admission, the replacement of these losses with blood or plasma is necessary and should be effected before low spinal block analgesia is undertaken.

I am indebted to Lieutenant-Colonel I. R. Hudleston for permission to send this article for publication, and to Major H. G. Page for his helpful criticism.

THE INCIDENCE OF POTENTIALLY PATHOGENIC STAPHYLOCOCCI IN THE NOSE AND ON THE SKIN OF HEALTHY SUBJECTS.

BY MAJOR A. NIMMO SMITH, M.B., CH.B. EDIN.,
Royal Army Medical Corps.

It has been shown by several workers that potentially pathogenic staphylococci can be isolated from the nose and from the surface of the skin of apparently healthy people (McFarlan, 1938; Devenish and Miles, 1939; Gillespie, Devenish and Cowan, 1939).

In the present investigation a hundred individuals were examined. The subjects were all volunteers, all men in good health, and were drawn from the personnel of a General Hospital.

Each volunteer was "sampled" in the same way. One swab was passed into both nostrils and a second, moistened in sterile broth, was rubbed for from fifteen to twenty seconds over a circular area about an inch and a half in diameter on the back of the right wrist. Each of the swabs was used to inoculate a plate of Fildes' peptonized sheep blood agar. The plates, after incubation at 37° C. for twenty-four hours, were left on the bench at room temperature for a further period of forty-eight hours to allow pigment to develop before picking colonies of staphylococci for further examination. Golden or yellow colonies were investigated and, where there were no colonies showing these types of pigment, white colonies of staphylococci were chosen.

Coagulase production appears to be a reliable test for a potentially pathogenic staphylococcus. Chapman (1938) considers it to be the most reliable single test for the differentiation of pathogenic from non-pathogenic staphylococci. In this series the production of coagulase was relied upon as an indication of the potential pathogenicity of the staphylococci isolated. The property of producing coagulase is found principally among the "aureus" strains but is shared by many yellow and white varieties also; thus the name *Staphylococcus pyogenes* has been suggested (Cowan, 1938) for any staphylococcus causing coagulation of human plasma and producing α -hæmolysin. Cowan also found that there was an absolute correlation between the production of coagulase and that of α -hæmolysin. Gillespie *et al.* (1939) found that 112 coagulase-positive staphylococci were also producers of α -hæmolysin.

Only eleven of the coagulase-positive strains in the present series were tested for α -hæmolysin and all were found to lyse rabbit erythrocytes when grown in broth for forty-eight hours in an atmosphere containing twenty per cent CO₂.

INVESTIGATION OF STRAINS ISOLATED.

All the strains of staphylococci isolated from the volunteers in this survey were subcultured on agar slopes and tested for (a) pigment production, (b) production of coagulase, and (c) fermentation of mannitol.

(a) For pigment production the subcultures on agar were incubated at 37° C. for twenty-four hours and examined after they had been left on the bench in daylight for from forty-eight to seventy-two hours. Generally there was no difficulty in classifying a culture as producing gold, yellow, or white pigment. Although in some cases pigment was not very well produced, even slight pigmentation could be easily identified as gold, yellow or white when a loopful of the growth was spread on white paper.

(b) For coagulase production the organism was grown in broth for twenty-four hours at 37° C. and then equal quantities of the culture and of human plasma were mixed in small tubes (3 by $\frac{3}{8}$ inch). The mixture was kept in the incubator for four hours at 37° C. and a preliminary reading made. After standing on the bench overnight the tubes were again examined and a final reading made. Plasma from the same donor was used throughout, and the plasma was never more than a week old, generally being used within twenty-four hours of the blood being obtained. It was often found that coagulation of the plasma took place within an hour at 37° C. and in no case did coagulation occur after standing overnight in a mixture where it had not been seen after four hours in the incubator. In one or two instances, on the other hand, it was noted that where coagulation had been quite definite although not complete on being taken out of the incubator, it had disappeared when the tubes were examined next morning.

(c) Fermentation of mannitol was tested by growing the staphylococcus in peptone water containing 1 per cent of mannitol with Andrade's indicator. The cultures were examined daily and a negative was recorded only after incubation had been carried out for seven days without the production of acid. As a rule, when fermentation took place, it was obvious in from forty-eight to seventy-two hours, sometimes being seen in twenty-four hours.

RESULTS.

(a) *Pigment Production*.—74 nasal strains were examined. There were 29 showing golden pigment, 6 yellow, and 39 white. Of the 68 skin strains 9 were golden, 16 yellow, and 43 white.

TABLE I.—PIGMENT FORMATION BY NASAL AND SKIN STRAINS.

Source	Gold	Yellow	White	Total
Nasal ..	29 (39.1%)	6 (8.1%)	39 (52.7%)	74
Skin ..	9 (13.2%)	16 (23.5%)	43 (63.2%)	68

(b) *Coagulase*.—Of the 74 nasal strains isolated 32 were found to produce coagulase: 29 gold, 2 yellow, and 1 white. 68 strains were isolated from the skin, but only 5 of these were coagulase-positive, all five producing a golden pigment.

Coagulase-positive staphylococci were isolated from the nose alone in 28 per cent of the subjects examined, from both skin and nose in 4 per cent, and from the skin alone in one case only, giving a total of 32 per cent nasal carriers and 5 per cent skin carriers. All nasal strains which showed golden pigment (29) were coagulase-positive, but out of 9 golden skin strains only 5 were coagulase-positive. Staphylococci producing yellow pigment numbered 22, of which 6 were nasal and 16 from the skin; of these none of the skin strains produced coagulase, while only 2 of the 6 nasal strains were coagulase-positive. Out of 82 white strains (39 nasal and 43 skin) only one, a nasal strain, was a producer of coagulase.

(c) *Fermentation of Mannitol*.—All the staphylococci isolated were tested for fermentation of mannitol. In no case did a coagulase-positive strain, whether derived from the nose or from the skin, fail to ferment mannitol. On the other hand, many of the staphylococci which did not coagulate human plasma in the test were fermenters of mannitol. The results of the coagulase and mannitol tests are summarized in Tables II and III.

TABLE II.—NASAL STAPHYLOCOCCI (74 STRAINS).

Pigment	Coagulase +	Coagulase -	Mannitol +	Mannitol -
Gold	29	0	29	0
Yellow	2	4	3	3
White	1	38	7	32

TABLE III.—SKIN STAPHYLOCOCCI (68 STRAINS).

Pigment	Coagulase +	Coagulase -	Mannitol +	Mannitol -
Gold	5	4	8	1
Yellow	0	16	13	3
White	0	43	23	20

DISCUSSION.

The fact that potentially pathogenic staphylococci (i.e. staphylococci able to coagulate human plasma) can be found in the nose and on the skin of a large number of apparently healthy people must be of importance to the surgeon as it discloses a possible source of staphylococcal infection of wounds. Devenish and Miles (1939) showed that *Staph. aureus* could be found on the hands of the operator after operation (they could be grown from the inside of the operating gloves) and traced the passage of staphylococci to the wound through glove punctures. Their work showed that nasal carriers were less dangerous, as a layer of cellophane interposed between the layers of butter muslin can prevent staphylococci from reaching the wound through the mask.

McFarlan (1938), investigating the subject in healthy undergraduates, isolated pathogenic staphylococci from the nose in 34 per cent of cases. He was also successful in finding these organisms in the noses of 42 per cent of adults and 58 per cent of children in hospital.

Devenish and Miles (1939) showed that, of 40 individuals, including senior operating staff, theatre and ward orderlies, dressers, and a few

patients, 18 carried pathogenic staphylococci in the nose, 2 carried staphylococci on the skin as well as in the nose, while in one case the result was positive from the skin only. Examining 159 students Gillespie, Devenish and Cowan (1939) found the nasal carrier rate of *Staph. pyogenes* to be 43.4 per cent, the skin carrier rate 19.5 per cent, while, in 12.6 per cent, pathogenic staphylococci were isolated both from the nose and from the skin.

In the present investigation of 100 healthy volunteers the nasal and skin carrier rates were not so high as some of those quoted above, especially as regards the skin carriers, where a positive result was obtained in only 5 per cent.

SUMMARY.

(1) One hundred healthy male volunteers were examined by swabbing the nose and skin, the swabs being plated out on Fildes' peptonized sheep blood agar.

(2) The staphylococci isolated were tested for (a) pigment, (b) coagulase, and (c) fermentation of mannitol.

(3) The total nasal carrier rate was 32 per cent and the total skin carrier rate 5 per cent.

(4) Of the "positives," 28 per cent were nasal carriers only, 1 per cent carried on the skin alone, while 4 per cent were double carriers (nose and skin).

(5) The majority of the coagulase-positive strains were "aureus" but some yellow and white strains also could coagulate human plasma.

(6) Coagulase-positive staphylococci always fermented mannitol but, among the coagulase-negative strains, there were many mannitol fermenters.

(7) The presence of potentially pathogenic (coagulase-positive) staphylococci in the nose and on the skin of healthy individuals suggests a possible source of staphylococcal infection of wounds.

My thanks are due to Colonel Leonard Colebrook and Professor A. A. Miles at whose suggestion this work was undertaken and to Professor Miles for providing every facility in his laboratory. My thanks are also due to the N.C.O.s and men who so readily volunteered for the investigation.

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Editorial.

MINIATURE RADIOGRAPHY AND SPUTUM EXAMINATION IN 100,000 AUSTRALIAN RECRUITS.

MINIATURE radiography has been adopted in the recruitment of men for the Royal Navy and for the Royal Air Force. These two Services, although greatly enlarged in war time, deal with numbers of recruits which, compared with the British Army, are relatively small. It is, in the words of Lord Horder's Committee, "because of lack of apparatus, lack of sufficient numbers of expert examiners, and because the inclusion of this form of examination would seriously delay the medical examination of recruits," that the very large number of men so far examined for entry into the British Army have passed into the service of the Crown without "miniature radiography."

That the decision to forego this great aid to diagnosis has been wise, in the absence of definite proof of its practicability when applied to very large numbers, is evident to all acquainted with the details of Army recruiting; but it may become less "impossible" as experience accumulates.

The latest example of such a test comes from Australia and is dealt with in the *British Medical Journal* of May 10, 1941, by Major Douglas Galbraith, D.A.D.G. of Medical Services, Australian Army Medical Corps, in a paper entitled "Pulmonary Tuberculosis in Recruits."

In this article Major Galbraith describes the application of miniature radiography for routine chest examination to 100,000 men and considers that, owing to this amplification, it has been found that "one in every 100 has shown radiological evidence of active or latent tuberculosis and one in every 200 of active tuberculosis." This is, as it should be, a slight underestimate of the numbers. Out of 100,000 men examined, 1.04 per cent showed signs of active or latent tuberculosis and 0.56 per cent gave a definite indication of activity.

Major Galbraith says, furthermore, that "the average cost for each ex-soldier with pulmonary tuberculosis has approximated £3,000." A saving of something approximating £300,000 would seem therefore to have been made, if we allow that, at least, the 100 men proved to be sputum-positive were actually tuberculous.

The cost per recruit averaged between 5d. and 6d. including cost of film, cost of processing, wages of staff and salaries of specialists, and the additions for maintenance and depreciation of plant bring the cost to approximately 10d. per man. This means a total expenditure of £4,166 12s., and a saving of £300,000. It sounds, on the face of it, a good bargain!

There is also, in the same number of the *British Medical Journal*, a complementary article on "Bacteriological Examination supplementing the

Radiographical Survey of the Australian Imperial Forces," by Reginald Webster, Honorary Major, Australian Army Medical Corps Reserve. Major Webster did not merely examine the sputum, where this was available, for acid fast bacilli but cultured every negative sputum and examined by the microscope and by culture the gastric mucus from all in whom lung sputum could not be obtained.

"The number of men rejected or deferred by reason of X-ray evidence of tuberculosis and in whom bacteriological examination was undertaken, was 271. Of these, 100 (36.9 per cent) were shown to be actively discharging bacilli." In a group of 152 men, in whom the radiograph was regarded as indicative of active pulmonary tuberculosis, the number of positive bacteriological findings was 83 (54.6 per cent) whilst in 90 men designated as showing the lesions of old, healed, inactive or doubtful tuberculosis, there was 11.1 per cent of positives.

In a third group, consisting of three men in whom there was no sign of a tuberculosis lesion in the lungs yet they had been sent for examination on some grounds or other, sputum culture or gastric culture proved to be positive in all three.

These two articles make excellent reading. They are concise, convincing, and based on work of the extreme competence which we have learnt to associate with Australian medical officers.

To Major Webster we should like to extend a special welcome for his new facts about tuberculosis. He quotes the work of Meunier, of Armand de Lille and Vibert, of Wallgren, Poulsen, Stiehm, Collis and Brockington, Kayne and Hounslow, Shrewsbury and Barson, C. A. Green and Corper and Cohn; but we regard this investigation, carried out in close collaboration with Major Galbraith's brilliant X-ray studies on a section of the population of Australia which had been already found fit for duty by a thorough clinical examination, as particularly striking. We have always held that at least some of the symptomless, signless, healthy people around us would prove to be excreting tubercle bacilli if they were thoroughly examined, a matter of little concern during peace-time but of extreme importance in war. Perhaps Major Webster, some day, will follow up his "positive" results in the three men with "healthy" lungs by telling us how many healthy "contacts" with tuberculous people are themselves "carriers" of the germ.



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Clinical and other Notes.

THE CLARIFICATION OF WATER FOR RE-USE BY A MOBILE BATH UNIT.

BY MAJOR G. V. JAMES,

Royal Army Medical Corps.

THE entire Bath Unit when working to capacity utilizes about 600 gallons of water per hour and under the present system this is run to waste. In many localities this consumption of water may be a serious tax on local sources and hence the problem of treatment and re-use arises.

The treatment to be applied to this water is essentially one of clarification with desiderata that the resulting effluent should not clog the jets of the shower roses nor must it be corrosive to the apparatus during re-use.

Preliminary experiments with alum and lime, and with ferrous sulphate and lime, together with or without a weighting agent such as Stellafilt, showed the superiority of ferrous sulphate treatment. Use of a weighting agent appeared to be wasteful and unnecessary as the experiments showed that the degree of clarification and speed of sedimentation were not affected thereby. One great advantage of the ferrous sulphate was the immediate destruction of the surface tension effects of the dissolved soaps in the ablution water which materially retards clarification by other chemicals.

Substitution of bleaching powder W.S.P. (water sterilizing powder) for lime further speeded clarification.

When the clarified effluent was pumped into another tank for re-use it was found that the effluent showed turbidity due to material drawn into the hose by the suction of the pump. To overcome this a simple filtering device was introduced which could be duplicated in the field and which did not materially lower the filtering efficiency. The treatment could be greatly aided if the ablution water ran through an efficient grease trap first. The two following Tables give the results obtained by treating ablution water, re-using the effluent and retreating for several times.

TABLE I.

				Turbidity.	pH	Hardness.	Iron.
Ablution water	..	..	..	Soapy	8.5	18	nil
Treated water	..	..	..	Clear	8.5	20	nil
Re-used 1st time	..	..	..	Soapy	8.5	20	nil
Treated	..	..	..	Clear	9.0	20	nil
Re-used 2nd time	..	..	..	Soapy	9.5	20	nil
Treated	..	..	..	Clear	10.0	21	nil

Due to the increase in pH value the experiment was repeated cutting down the quantities of reagents added in treatment subsequent to the first, and so taking advantage of the reagent sparing effect of the sludge.

In Table I the amounts of reagents used in each treatment were 15 grains ferrous sulphate and 7.5 grains bleaching powder per gallon followed by 15 minutes' sedimentation.

In Table II the first treatment was 15 grains of ferrous sulphate and 7.5 grains bleaching powder per gallon, the second treatment was 7.5 grains ferrous sulphate and 3.75 grains bleaching powder per gallon while all subsequent treatments were 3.75 grains ferrous sulphate and 1.875 grains of bleaching powder per gallon.

The continued results of treatment of the water may be summarized as a rise in the free chlorine of the water but not sufficient to render it corrosive to the apparatus, a rise of pH which is insignificant, a rise of chloride due to the use of bleaching powder and finally a rise in hardness which, if carried too far, may cause "furring" of the heating apparatus and shower roses due to deposition of calcium sulphate.

Against the rise in hardness as indicated there is the fact that it will be necessary in practice to use some "make-up" water which will have a hardness equal to that of the original ablution water and will dilute the treated water in proportion to the relative volumes used.

TABLE II.

	Turbidity.	pH	Hardness.	Iron.	Free Chlorine.	TOTAL.
Ablution water ..	Soapy	8.5	16	nil	0.00	0.281
1st treatment ..	Clear	8.0	20	nil	0.10	0.78
1st re-use ..	Soapy	8.0	20	nil	0.02	
2nd treatment ..	Clear	8.0	24	nil	0.08	0.78
2nd re-use ..	Soapy	8.0	23	nil	0.02	
3rd treatment ..	Clear	8.0	22	nil	0.12	0.85
3rd re-use ..	Soapy	8.4	21	nil	0.10	
4th treatment ..	Clear	8.0	22	nil	0.14	0.92
4th re-use ..	Soapy	8.5	22	nil	0.08	
5th treatment ..	Clear	8.0	25	nil	0.16	1.00
5th re-use ..	Soapy	8.0	24	nil	0.14	
6th treatment ..	Clear	9.0	27	nil	0.20	1.10
6th re-use ..	Soapy	8.5	26	nil	0.10	
7th treatment ..	Clear	8.8	27	nil	0.25	1.15
7th re-use ..	Soapy	8.8	27	nil	0.20	
8th treatment ..	Clear	9.0	32	nil	0.30	1.20
8th re-use ..	Soapy	8.8	31	nil	0.18	
9th treatment ..	Clear	9.0	34	nil	0.32	1.22
9th re-use ..	Soapy	9.0	34	nil	0.25	
10th treatment ..	Clear	9.0	36	nil	0.35	1.28
10th re-use ..	Soapy	8.8	35	nil	0.25	

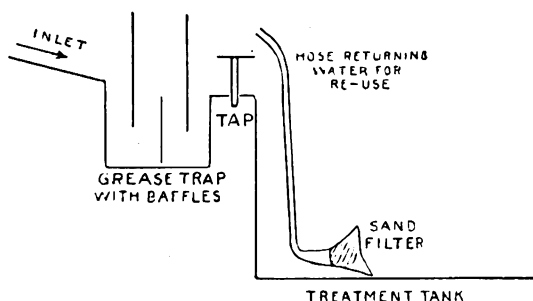
All the above results are expressed as p.p. 100,000.

The recommended plant layout is shown in the accompanying diagrams. A zeolite water softener could be incorporated to reduce the hardness of the treated water and would be placed on the hose returning the water for re-use.

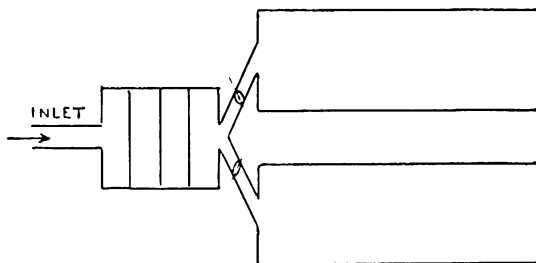
The filter can easily be made from an old petrol tin cut and soldered into a funnel-shaped fitment for the hosepipe leading via the pump to the heating apparatus. Into the funnel is placed a ration bag or other suitable material made into a bag filled with coarse sand. On the application of

suction the bag is packed in towards the funnel channel and the water has to pass through the sand. The whole funnel is supported by blocks or other arrangement about 2 inches above the floor of the tank, the sludge collecting below this level.

The chemical treatment consists of adding 50 scoopfuls of powdered ferrous sulphate dissolved in water for every 100 gallons of ablution water to be treated. Thorough mixing follows and then 25 scoopfuls of bleaching powder made into a paste and again the whole is thoroughly agitated and then allowed to sediment for fifteen minutes or as long as possible before pumping off the supernatant liquid. (A scoop from a bleaching powder



ELEVATION.



Duplicate treatment tanks (one collecting water whilst other tank and contents are sedimenting).

PLAN.

tin is used throughout as it contains 30 grains of powdered ferrous sulphate when filled and levelled off.) When the tank is next filled 25 scoopfuls of powdered ferrous sulphate in solution are added, agitated, including a thorough stirring up of the sludge formed in the first reaction and then $12\frac{1}{2}$ scoops of bleaching powder made into a paste. After 15 minutes' sedimentation the water may be pumped off.

Subsequent treatment is to add 12 scoops of powdered ferrous sulphate in solution and 6 scoops of bleaching powder made into a paste, thoroughly agitating and stirring up the pre-formed sludge which effects a saving of reagents and also hastens coagulation.

The filter should be frequently cleaned ; this is easily done by removing the bag of sand and shaking it well in running water, then replacing it in the funnel.

After several days there will be an accumulation of sludge. In order to keep the tank capacity at the maximum some of the sludge should be pumped into a drain or on land to dry. Some sludge must always be left behind to assist subsequent action.

CASE OF CONGENITAL RIB DEFORMITY.

BY LIEUTENANT IAN F. SOMERVILLE,

Royal Army Medical Corps.

A CASE of rib deformity of some interest was seen recently when F. G., a gunner, aged 23, appeared before a Medical Board. He had six months' service. It was recorded on his Medical History Sheet that, on entry, the left side of the chest was ill developed. He carried on his duties as a waiter in civil life without discomfort.

Recently he went sick on account of dyspnoea, pains over the left side of the chest and palpitation, symptoms occurring after the heavy exertions which a gunner may be called upon to perform.

On admission to hospital he was found to have a fully compensated mitral incompetence. It was noted too that a sulcus was present over a flattened area of the left side of the thorax in front extending from the horizontal level of the nipples upwards for $3\frac{1}{2}$ inches and laterally from the left edge of sternum to near the anterior axillary fold. Radiographs indicated :

(1) The absence of the anterior portions of the left 3rd, 4th, and 5th ribs. (2) The 2nd left rib was at a much lower level than the 2nd right rib. (3) The portions of the left 3rd, 4th, and 5th ribs which were present were much thinner than the normal ribs.

The effect of these malformations on the performance of the man's duties, such as rifle drill, wearing a heavy pack, taking part in boxing competitions, required consideration since there existed a deficient rigid protection for the heart and pressure exerted on the shoulders would produce unequal strain on the two sides of the thorax.

Cases of rib deformities of congenital origin have been reported from time to time [1, 2, and 3] but, so far as the literature available to the author is concerned, none of these malformations were of the same kind as the one under review.

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- [3] STEEL, W. D. *Ibid.*, July 1, 1939.

ANÆSTHETIC APPARATUS FOR USE IN THE FIELD.

By MAJOR R. BINNING,
Royal Army Medical Corps.

IN any consideration of anæsthetic apparatus for use in the field it is commonly held that rotameters are too fragile to stand up to the work and to the conditions of transport.

In this connection the following experience may be of interest. When my hospital went to France in September 1939, I took with me an Ivor Lewis's apparatus of my own that embodied three rotameters. This was in daily use in a tented theatre for six months (*see Brit. Med. Journ.*, December 7, 1940, vol. II, p. 794). In the course of duty and leave it made, altogether, four crossings of the Channel. In the evacuation of the hospital it was carried by ambulance, not in a case, from Dieppe to Le Mans and then to Rennes. Here a case was improvised for it from a wooden petrol tin case and it finally arrived back in England in perfect working order. Throughout the whole time the rotameters never gave the slightest trouble.

The importance of all this is that rotameters, or some form of flowmeter that is equally accurate, are essential for closed circuit anæsthesia. This form of anæsthesia has many advantages but the most important, from the point of view of an Army in the field, is the very great economy it effects in the use of gases. Gas cylinders are heavy and troublesome things to transport and the saving effected by closed circuit anæsthesia is considerable. I do not know of any large scale investigation that has been made to determine exactly what is the saving in gases but it certainly amounts to more than 60 per cent.

Current Literature.

Vaginal Discharge. *Lancet*, September 7, 1940.

A distressing complaint and difficult to treat. Discharge due to polypus and submucous myoma is at once recognized. Other causes are gonorrhœa, *Trichomonas vaginalis* and *Monilia*.

The naked-eye characteristics of gonorrhœa in the acute stage are vascular cervicitis and urethritis with a thick yellowish-green discharge. Infection with *Trichomonas vaginalis* betrays itself in strawberry red patches on the vaginal walls with a thin and frothy discharge. A Gram stain may clinch the diagnosis of gonorrhœa and a drop of pus diluted with warm saline placed under a coverslip and viewed with a high power will reveal the motile, flagellate, oval *Trichomonas* parasite. Familiar to American writers there is a third type of vaginitis caused by the *Monilia* or *Oidium albicans*. Matters has drawn attention to the ætiology of this type of

vaginitis as met with in America. Its presence should be sought in all cases where necrotic white patches are found in the vaginal vault and cervix in association with a profuse burning discharge and sometimes with epithelial excoriation on the vulva and thighs. The diagnosis is established by the same technique as for the *Trichomonas* and by the appearance of yeast buds and mycelia on the slide. The organisms are oval and 5μ long.

Matters considers that *Monilia* infections are best treated by swabbing the vaginal walls with hydrogen peroxide or dilute liquor potassæ, drying them, and insufflating powdered silver picrate in kaolin. The powder is used daily for three days. Alternatively the vagina may be swabbed out with Bonney's blue paint. Matters has obtained the best results for *Trichomonas* infections with silver picrate insufflations; a seven-day course is needed.

For *Trichomonas* infections Lloyd and Mascall use Negatol. Of forty-seven cases treated, forty-five were symptom-free at the end of the course of treatment, and when examined seven months later only four were found to have relapsed.

CRUICKSHANK, R. **Air-borne Infection and its Prevention.** *Pub. Health.* 1940, v. 53, 254-5. [13 refs.]

In this paper are summarized recent conceptions regarding the spread of air-borne infection and its prevention. It is emphasized that modern scientific work has rendered Gaiger's distinction between droplet and air-borne infection susceptible of proof and that it is no longer permissible to regard respiratory infections as being spread only by direct contact, fomites, manual transmission and the like, but that we must now take into consideration bacterial pollution of the air by infected dust and droplet nuclei. That pathogenic organisms remain virulent and viable in these has been demonstrated of recent years by both bacteriological and epidemiological studies. The most important preventive measures for air-borne infection are the avoidance of overcrowding, the provision of adequate ventilation, and the suppression of dust. For the last mentioned frequent use of soap and water, damp dusting and sweeping, vacuum cleaning, the use of crude liquid paraffin on floors, and quilts instead of blankets are advocated. The employment of ultra-violet light and aerosols in the prevention of air-borne infection is discussed and after consideration of the present status of these methods the author asks if it is not too much to hope that we may be on the threshold of an attack upon the incidence of respiratory infections similar to that ushered in by the water carriage system of sewage disposal for the intestinal infections.

A. JOE.

Reprinted from "*Bulletin of Hygiene*," Vol. 16, No. 2.

Reviews.

HUTCHISON'S FOOD AND THE PRINCIPLES OF DIETETICS. 9th edition.
Revised by V. H. Mottram, M.A.Cantab., and George Graham, M.D.
Cantab., F.R.C.P.Lond. London: Edward Arnold & Co. 1940.
Pp. xxvii + 648. Price 21s. net.

We welcome the ninth edition of Hutchison's "Food and the Principles of Dietetics."

It is interesting to recall that the first edition, published forty years ago, like some other well-known books by the same author, was based on a course of lectures delivered by him to students of the London Hospital.

At that time, Sir Robert Hutchison was one of the first to appreciate the importance of the scientific study of nutrition in the feeding of the people and the treatment of disease.

In later years when the country became conscious of the newer knowledge on nutrition and much new work was published on the subject we have been glad to be able to refer to Hutchison for the sanity of his views on dietetic problems.

The task of revision has been entrusted entirely to Professor V. H. Mottram and Dr. G. Graham and we congratulate them on the success of their efforts.

The new edition aims more at being a textbook and less of an encyclopædia on dietetics. Its revision has entailed much rearrangement and rewriting to accord with the ever-increasing development of the subject and has resulted in an alteration of the emphasis formerly laid on various constituent parts of the book. Many of the chapters have been entirely rewritten but a feature of previous editions—the numerous references to original papers in the form of footnotes—has been retained.

The subject of nutrition in war time is of the first importance and we confidently recommend this excellent textbook to all medical students and practitioners. We feel the authors have maintained Sir Robert's achievement in producing a book which will prove intelligible and interesting to anyone desiring to acquire some knowledge of food and the difficult problems of nutrition.

F. McK.

ILLUSTRATIONS OF REGIONAL ANATOMY, SECTIONS I—V. 3rd edition.
By E. B. Jamieson, M.D. Edinburgh: E. & S. Livingstone. 1941.
Price: Section I, 7s. 6d.; Section II, 15s.; Section III, 6s.; Section IV, 4s.; Section V, 4s.

Sections I—V of this work deal with the central nervous system, the head and neck and the trunk and appear in their 3rd Edition. The number of illustrations has been increased to 218. The illustrations are most pleasing and informative. They lose nothing by being in many instances

diagrammatic. Indeed it is often the reverse and the diagrams which illustrate the anatomy of the upper abdominal viscera and their peritoneal connections display with surpassing clarity and precision the intricacies of this region.

Every proficient surgeon must be in some measure an anatomist. The less experienced will have frequent need to refresh his memory of unfamiliar surroundings, the more experienced will have a lesser need, but both will find profit in the study of this work.

It is curious that there should be no illustrations of the lymphatic system and its glands. G. M.

REPORT OF THE COMMITTEE OF INQUIRY INTO TRAINING, CONDITIONS OF SERVICE, AND WAGES OF DENTAL MECHANICS. By The British Dental Association, The Incorporated Dental Society, and The Public Dental Service Association. Price 1s. 6d. net.

The exhaustive inquiry made by the three dental organizations into the vexed question of training, conditions of service and wages of dental mechanics has been of signal service both to the profession of dentistry and to the craft of dental mechanics.

The Committee has sought and obtained evidence from a very wide field whence active witnesses were forthcoming to represent all aspects of subjects within the terms of reference.

That section of the report dealing with the training of dental mechanics is worthy of the closest study and consideration.

There appears to be general agreement amongst witnesses upon the need of a five years' formal indenture in the training of dental mechanics.

In their recommendations the Committee deplore the decline of the apprenticeship system and the reader of the Report is left in no doubt as to the urgent need for its reintroduction.

Of great interest, too, is the information which has been brought to light concerning the examinations in dental mechanics held by the City and Guilds of London Institute.

There seems to have been no evidence in support of the canard that a high incidence of sickness obtains amongst dental mechanics.

Employers, however, are very properly enjoined to ensure that the accommodation and appointments of dental laboratories should conform to a good standard of hygiene.

The recommended rates of pay for trained craftsmen and indentured apprentices are of necessity based upon conditions current when the Report was made though, in the opinion of the reviewer, they are somewhat low.

It would seem, however, that any substantial increase in wages would have to be considered *pari passu* with increases in the Dental Benefit Scale of Fees.

The report is at once instructive and comprehensive and it is much to be hoped that the well considered and convincing recommendations of the Committee will be put into effect.

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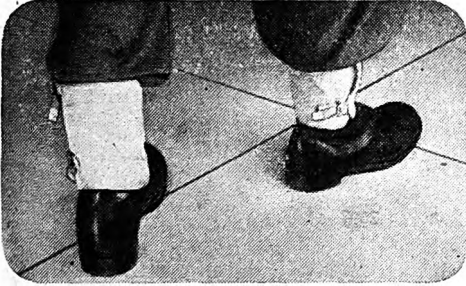
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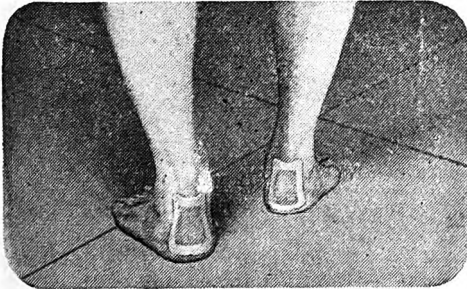
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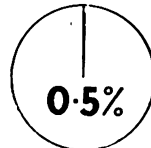
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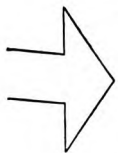
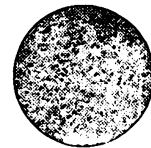
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JOURNAL

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Corps News.

JUNE, 1941.

EXTRACTS FROM THE "LONDON GAZETTE."

April 22.—Col. (actg. Maj.-Gen.) P. S. Tomlinson, *D.S.O.*, *M.R.C.P.* (5847) (late *R.A.M.C.*), to be temp. Maj.-Gen. Apr. 10, 1941.

April 25.—The undermentioned Capts. (Short Serv. Offs.) are apptd. to perm. commns. retaining their present seniority :

Apr. 23, 1941 :

R. J. G. Morrison, *M.C.* (67302).
(War Subs. Maj.) J. W. Orr, *M.C.*, *M.B.* (67847).

J. A. G. Carmichael (67840).

A. T. Marrable (67301).

J. Shields (67295).

C. W. Maisey (67299).

(Temp. Maj.) K. H. Harper (67855).

T. M. W. D'Arcy (67849).

(Temp. Maj.) M. F. Kelleher, *M.C.*, *M.B.* (67845).

Apr. 24, 1941:

(Temp. Maj.) J. A. MacDougall, *M.D.* (68237).

Apr. 25, 1941:

D. Wright, *M.B.* (65320).

April 29.—Capt. J. E. C. Robinson, (62456)

from *A.D. Corps.*, to be Capt. Mar. 23, 1941, with seniority Oct. 29, 1937.

May 6.—Capt. (temp. Maj.) C. P. Stevens, *M.B.* (66479), a Short Serv. Off., is apptd. to a perm. commn. May 1, 1941, retaining his present seniority.

May 16.—Lt.-Col. E. F. W. Grellier, *M.B.* (26361), having attained the age for retirement, retires, May 17, 1941, and remains empld.

Maj. (temp. Lt.-Col.) T. Young, *M.B.* (10380), to be Lt.-Col. May 17, 1941.

Regular Army Reserve of Officers.

April 29.—Capt. C. W. Sparks, *M.C.* (51074), to be Bt. Maj. Jan. 28, 1941, under the provs. of Art. 168, Royal Warrant for Pay and Promotion, 1940.

May 2.—The surname of Lt.-Col. I. R. HUDLESTON, *D.S.O.* (50542), is as now described, and not as in the *London Gazette* of Apr. 15, 1941.

May 6.—War Subs. Capt. C. W. Simpson, *M.C.*, *M.B.* (38216), ceases to belong to the Res. of Off. on account of ill-health. Apr. 16, 1941. (Substituted for the notifn. in the *London Gazette* of Apr. 15, 1194.)

THE ARMY DENTAL CORPS.

April 18.—Capt. C. A. Pank (50316), to be Maj. Apr. 1, 1941.

April 29.—Capt. E. B. Armitage (51044)

ceases to belong to the Res. of Off. on account of ill-health. Apr. 29, 1941.

QUEEN ALEXANDRA'S IMPERIAL MILITARY NURSING SERVICE.

April 18.—Sister E. C. Brereton retires receiving a gratuity. Apr. 1, 1941.

The undermentioned Sisters resign their appts :

Miss E. E. MacDonald. July 14, 1940.

Miss J. Mitchell. Apr. 3, 1941.

April 25.—The undermentioned Sisters resign their appts. :

Miss J. N. Rowland. Apr. 1, 1941.

Miss I. Jones. Apr. 12, 1941.

Miss D. H. E. Benson. Apr. 14, 1941.

Miss P. M. Jeavons. Apr. 16, 1941.

May 2.—Sister Miss J. P. Rorison retires, receiving a gratuity. Apr. 27, 1941.

May 16.—The undermentioned Sisters resign their appts.:

Miss E. Clarke. Mar. 14, 1941.

Miss E. N. M. Lunn. Apr. 22, 1941.

Miss D. A. J. Crowley. Apr. 30, 1941.

The following telegram was sent to Field-Marshal H.R.H. the Duke of Connaught and Strathearn, K.G., on the occasion of his birthday:

"Colonels Commandant and all ranks Royal Army Medical Corps submit their most respectful greetings to their Colonel-in-Chief on his 91st birthday."

The Colonel-in-Chief replied as follows:

"So grateful for kind message, please convey to Colonels Commandant and all ranks Royal Army Medical Corps my deep appreciation of their good wishes."

ROYAL ARMY MEDICAL CORPS AND THE ARMY DENTAL CORPS COMFORTS GUILD.

GUILD NOTES.

SINCE the last issue of the Journal, wool rationing has come into being. We are happy to say that we shall still be able to obtain wool for our comforts through the Director of Voluntary Organizations, the only proviso being that we keep a strict account of all wool issued and garments received. We also have to allow these accounts to be inspected if desired. All knitters will help us enormously if they will keep an account of their wool and garments and return it to us in the parcels.

We have been very busy with books and games this month, and have sent out a large number of parcels, chiefly to Field Ambulances, and to units of the Army Dental Corps stationed in isolated places. We have also sent books, games and toilet accessories to West Africa and the Middle East. We have discontinued sending woollies for the time being, and are gathering as large a

stock as possible to have in reserve for next autumn.

The badges for knitters have been applied for, but have not arrived yet. There is delay in obtaining them from the makers. Any applications will be noted and badges sent as soon as they come in.

We have had several requests for tennis racquets. The Guild does not supply sports gear, but if anyone has a racquet they do not want, we should be able to make good use of them. Please send to the Honorary Secretary, Headquarters Mess, Millbank, S.W.1.

Funds are coming in quite well, and we hope many more will support the scheme of contributing 2s. 6d. a quarter, or 10s. a year, to keep the finances healthy. Just over £150 was subscribed in May and we think June may beat that. An encouraging feature is, that we are now beginning to receive subscriptions from India, and we hope this will continue.

BIRTH.

MOLLAN.—On Christmas Day, 1940, in the Middle East, to Alison, wife of Lieutenant-

Colonel F. R. H. Mollan, M.C., R.A.M.C., a son (Brian Christopher).

DEATHS.

COLLINGWOOD.—On Apr. 11, 1941, in Clifton, Lieutenant-Colonel H. O. Percy Hildebrand Collingwood, R.A.M.C. Born in Deesa, India, April 2, 1871, he was educated at St. Thomas's Hospital, and took the L.S.A. in 1897. Commissioned Surgeon Lieutenant January 28, 1898, he was promoted Captain R.A.M.C. January 28, 1901, Major January 28, 1910, Lieutenant-Colonel March 1, 1915, and retired October 31, 1922. After retirement he worked with the Bristol Medical Mission. He served on the Nile in 1898, being awarded the Queen's and Khedive Medals. He was S.M.O. in the Aden operations in the interior in 1903-1904, and was specially brought to notice for good work with the Aden Boundary

Commission. He went to France on August 15, 1914, but was taken prisoner of war the same month. He was released and arrived home June 29, 1915. In the *London Gazette* January 30, 1920, he was brought to notice for valuable services rendered while prisoner of war. He returned to France in July, 1915, and remained there till March, 1916. He served in Macedonia from June, 1917, till the end of the war. He received the 1914 Star, British War and Victory Medals.

APPRECIATION of Colonel Collingwood, by Major Hubert C. Bristowe, M.D., Chairman of Committee, Bristol Medical Mission. Colonel Collingwood worked with the

Bristol Medical Mission from Jan. 1923 till his death. Sympathetic to the poor and suffering he won a strong place in the affection and esteem of his patients by whom his loss will be deeply felt. A man of simple and saintly character he was invaluable to the Mission.

KENDRICK.—In Cheddar on Apr. 26, 1941, Captain George Wharton Kendrick, R.A.M.C. Born in Wolverhampton, June 11, 1904, he was educated at St. Thomas's Hospital, and took the M.R.C.S.Eng., and the L.R.C.P.Lond., in 1932. Commissioned Lieutenant R.A.M.C. July 26, 1932, he was promoted Captain May 1, 1934. He acted as Adjutant 42 (East Lancashire) Division T.A. from June 19, 1939, till July 28, 1939, and was placed on the half-pay list owing to ill-health Jan. 3, 1940.

POE.—In Edinburgh on May 12, 1941, Colonel John Poe, C.M.G., D.S.O., late R.A.M.C., Retired. Born in Kilkenny Sept. 24, 1873, he was educated at Trinity College, Dublin, where he took the M.B. in 1896. Commissioned Surgeon-Lieutenant July 28, 1897, he was promoted Captain July 28, 1900, Major Apr. 28, 1909, Lieutenant-Colonel Mar. 1, 1915. Awarded a Brevet of Colonel in the New Year's Honours of 1918, he was promoted to the substantive rank on Feb. 7, 1918, and retired Feb. 7, 1924. He served in France from Aug. 22, 1914, till the end of the war; as A.D.M.S. from Apr., 1916. Five times mentioned in despatches, he received the Brevet of Colonel, was created C.M.G., and was awarded the D.S.O., 1914 Star and Clasp, British War and Victory Medals. He took part in the operations in Iraq in 1919-1921, receiving the Medal with Clasp.

EDITORIAL NOTICES.

The Editor will be glad to receive original communications upon professional subjects, travel, and personal experiences, etc., which should be in duplicate if possible according to King's Regulations.

Correspondence on matters of interest to the Corps, and articles of a non-scientific character, may be accepted for publication under a nom-de-plume.

All Communications or Articles accepted and published in the "Journal of the Royal Army Medical Corps," will (unless the Author notifies at the time of submission that he reserves the copyright of the Article to himself) become the property of the Library and Journal Committee, who will exercise full copyright powers concerning such Articles.

A free issue of twenty-five reprints will be made to contributors of Original Communications and of twenty-five excerpts in the case of Lectures, Travels, Clinical and other Notes, and Echoes of the Past.

Reprints or excerpts, additional to the above, can be furnished on payment if specially ordered at the time of submission of the article for publication.

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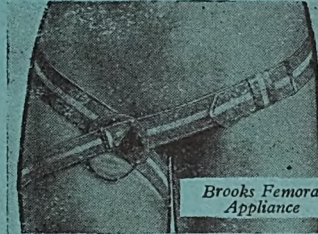
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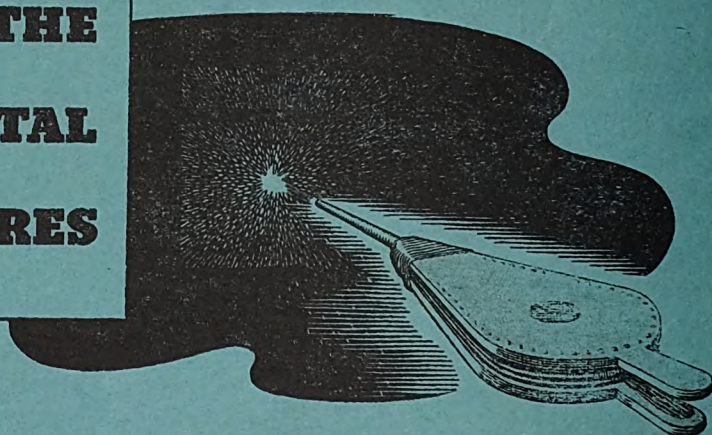


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Vol. LXXVII.

Journal

OF

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Royal Army



Medical Corps

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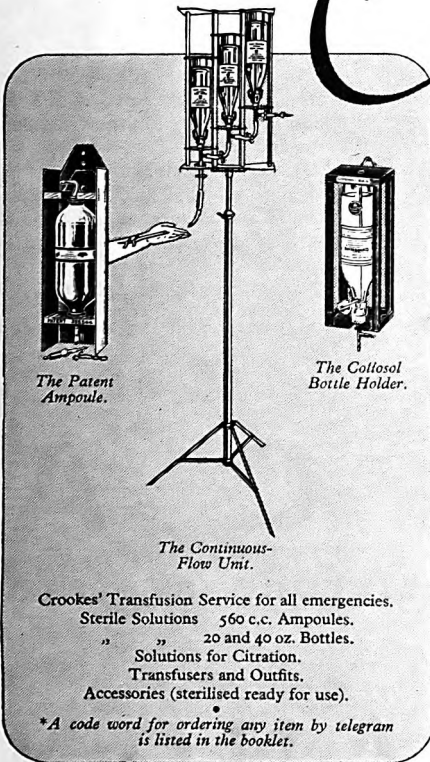
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: see *Lancet*, pp. 1107-1110.

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To all members of the Medical Services of the Army I address this brief note of farewell on the eve of resigning the appointment of Director-General.

Since March, 1938, I have been called on to shoulder many grievous burdens, none of them of our own making. I do not stress their magnitude. That can be appreciated by none save myself. Throughout this term of office I have been sustained by the loyal and devoted service of all who, at home and overseas, have upheld the best traditions of the past, and who in some fields have set up new standards of excellence for the future. None can doubt that fresh trials and vexations lie ahead, but your courage and steadfast fidelity to duty once more will prevail against them, whatever shape they take and wherever they may arise.

I wish you all good fortune, and at the same time I bid farewell to the Medical Services of the Army, whose best interests—as God gave me wit to see them—it has always been my honest endeavour to serve.

W. P. Mac Arthur,

July 31st, 1941.

Director-General, Army Medical Services.

Authors are alone responsible for the statements
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Journal of the Royal Army Medical Corps.

Original Communications.

BURNS IN WARTIME.

BY MAJOR MICHAEL C. OLDFIELD, M.Ch., F.R.C.S.,

Royal Army Medical Corps.

No. 2 Maxillo-Facial Surgical Team.

IN this war there has already been a serious number of burn casualties from incendiary and explosive bombs and it is feared that these casualties will continue for many months.

A high percentage of the wounded soldiers evacuated from Dunkirk and Narvik and civilians from the bombed areas round London have suffered from severe burns. An even higher percentage of sailors wounded in action with enemy aircraft has also been burnt. Many of the fighter pilots escaping from their crippled aircraft have landed safely but have been badly burnt about the face, hands and legs.

There is a general feeling of dissatisfaction with the usual methods of treating severe burn cases and many of the results are most distressing. The pain suffered by these patients is often indescribable. This seems to stamp an impression on the patient's mind and many, even of the most stoical, suffer from tragic psychological collapse. Some remain "nervous wrecks" others become "chronic alcoholics."

Three Degrees of Burn.—It is now generally agreed that there are only three degrees of burn of any practical significance :

1st Degree, scorching of the skin and erythema.

2nd Degree, blistering and partial skin destruction.

3rd Degree, at least full-thickness skin destruction¹ but including those that are deeper.

Dupuytren's six degrees of burn have survived merely for the purpose of catechising the student of medicine. No distinction should be made between burns and scalds; the pathology and treatment are identical. Clinically burn cases are classified as :

(i) Major burns.

(ii) Minor burns.

According to MacCollum [1] (1938) the percentage of total body surface represented by the different parts of the body in adults is :

Head	6 per cent.	
Trunk	40 per cent.	
Both upper extremities	16 per cent.	One hand 2 per cent.
Both lower extremities..	38 per cent.	One foot 3 per cent.

MINOR BURN CASES are those in which the burn is mainly of the 1st degree but with small areas of 2nd degree included. They do not involve vital areas, such as limb flexures which might result in crippling deformities, or altogether more than one-tenth of the body surface. They are usually cases which from their local and general condition are deemed suitable for ambulant treatment. A myriad of well-established methods, if intelligently applied, will yield excellent results. The two preparations which are most used to-day, owing to the convenience of their being stored in tubes and simplicity of application, are Amertan and Dettol burn jelly. These are applied after gentle cleansing with a mild, warm antiseptic lotion, such as acriflavine 1 : 1,000, and do not require the use of general anæsthesia. At first-aid stations it is permissible to apply local treatment only to these minor cases.

MAJOR BURN CASES are those which if not most carefully treated may die or suffer from crippling deformities. They include cases with any widespread burns involving more than one-tenth of the body surface especially if considerable areas are 2nd or 3rd degree in type. Most burns of the face, trunk, hands, and limb flexures are to be included in this category.

In order to avoid overburdening many well-worn themes a complete description of the treatment of burns will not be attempted but it is thought interesting to discuss briefly a few of the recent advances and some points of controversy.

FIRST AID.—No major burn case should receive any local treatment at the first-aid station apart from covering the exposed burnt areas with clean cloths or *tulle gras*². Arrangements should be made for these cases

¹ In the classical 3rd degree of burn described by Dupuytren, islets of skin were left intact and were capable of regeneration.

² *Tulle gras* is a useful dressing for burns because it does not adhere to raw surfaces and yet the discharges can escape through its wide mesh. It is made from curtain netting, after the sizing has been boiled out, by impregnating it with sterile vaseline and Balsam of Peru. It is stored in square or rolls with greased paper separating the various layers. *Tulle gras* can be made in any operating theatre or hospital dispensary if the directions given by D. A. Beattie are followed.

to be removed to hospital at once but, while they are waiting to be transferred, shock is treated by warmth, the administration of fluids and morphia. No major burn case should be undressed until the stage of primary shock has passed which is usually some hours after admission to hospital.

IN HOSPITAL.

(a) *General Treatment.*

Burn Centres and Burn Teams.—Special centres provided with carefully-trained “burn teams” should be organized in every district. It is now generally agreed that if efficient treatment is to be provided for cases of severe burns special centres and teams are essential. The occasional treatment given by a junior man who happens to be looking after the patients in a general surgical ward to which the burn case happens to be admitted is inimical to progress. Certain hospitals may be specially equipped for treating cases of burns or a certain number of side-wards set apart for these cases in the general hospital. At the “Burn Centre” treatment is undertaken by a group of specially trained teams who work in close co-operation :

(i) *Plasma infusion teams* for the treatment of shock.

(ii) *Theatre teams* :

(a) For cleaning up and applying local treatment in the early stages ;

(b) For skin-grafting in the later stages.

(iii) *Hæmatologists* who are responsible for taking samples of blood and making such investigations as :

Hæmoglobin concentration.

Cell concentration.

Plasma protein estimations.

(iv) *Bacteriologists* for investigating the type of infecting organisms. Nevertheless it is well to remember that success in the treatment of burns depends more than in any other surgical condition upon the enthusiasm, encouragement and sympathy of the ward sister.

Flies.—In summer and autumn special precautions must be taken to prevent flies infecting the wound and annoying the patient. Cotton-net should be fixed across all open windows. We believe that this method is preferable to the alternative one in which a “mosquito cage,” rather like a shower-bath curtain only made of net, is placed over the patient’s bed. Any streptococcus-disseminating villain who slips in through the door or around the net should receive summary justice by means of a “swotter,” the “flit-gun” or an ethyl chloride spray.

Treatment of Shock.—Plasma or serum infusion has proved to be an extremely valuable addition to the well-established methods of treating shock from burns. No grouping or compatibility tests are necessary. The volume of infusion should vary with the condition of the patient.

It is advisable in severe cases to give a massive infusion of two to four pints of warmed plasma as early as possible after admission to hospital. We

believe it is best to use unconcentrated plasma and infuse it by some gravity method using a cannula. At least 20 to 30 minutes should be spent giving the two to four pints. In severely shocked patients the veins are collapsed and it may be necessary to use extra positive pressure to start the infusion. To continue the injection of large volumes of fluid under pressure with a syringe is dangerous. The patient may die suddenly during, or shortly after an infusion, from dilatation of the right side of the heart.

The actual volume of plasma or serum given during the first forty-eight hours depends upon the concentration of the blood (estimated from the hæmoglobin percentage) and upon the level of the plasma proteins. As soon as the hæmoglobin and plasma protein concentrations have reached the normal level, plasma infusion is stopped.

For example, in a severe burn case in the stage of shock it is common to find the hæmoglobin percentage between 115 and 130 (Haldane normal being about 95 per cent) and the plasma protein about 4 grammes per 100 c.c. (normal being about 5 to 7 grammes per 100 c.c.). This indicates a serious degree of blood concentration caused by loss of plasma by exudation from capillaries into the tissues and also from the surface of the burnt area. With such findings as these on blood examination in the early stages, the indications for plasma infusion are absolute and urgent. Although at first some of the patients may not appear to be desperately ill, owing to the efficiency of temporary compensatory mechanisms, unless large volumes of plasma are infused sudden collapse may occur with little warning. In such cases the usual procedure is to give a massive infusion of two to four pints of plasma as soon as possible after admission. The patient is then taken to the theatre and given a gas and oxygen anæsthetic so that the burnt area can be cleaned up and local treatment, such as tannic acid 20 per cent, applied. A continuous drip infusion of plasma is started in the theatre and continued for about twelve hours; the duration of this infusion depends upon the condition of the patient and the hæmoglobin percentage of the blood. Frequent hæmoglobin estimations are necessary during this time. When the hæmoglobin percentage falls to a normal level (Haldane 95 per cent) the infusion is stopped, because if the blood is diluted with too much plasma, cedema of the lungs and other vital internal organs may occur before superficial cedema calls attention to the condition. It has been shown that plasma infusion is essential in the early stages of shock because the severely burnt patient is unable to mobilize enough plasma protein from his own reserves to tide him over the acute stages. In the later stages, however, a slight reduction in the plasma protein level of the blood can be made good by natural processes if the patient is able to take a mixed diet (Witts [2] 1940). A low plasma protein in the later stage therefore does not indicate that plasma infusion is necessary; in fact, if "toxæmia" is established plasma infusion may aggravate the condition. The factors to be considered in deciding whether to use plasma or serum are not yet fully established and on many occasions plasma and serum seem to be equally

efficient. Unconcentrated plasma is easily procured, simple to prepare, and, not being highly viscid, it can be administered by simple gravity methods. On the other hand, plasma is an ideal culture medium and most liable to contamination when stored for any length of time. Serum is more difficult to prepare but more easily stored and it can be supplied in a more concentrated form. It has been found useful in the treatment of œdema when used at three or four times normal strength ; being viscid it is more difficult to inject and a syringe is usually required for its infusion ; much smaller volumes however are necessary. Serum can be dried and stored for an almost indefinite period under suitable conditions and for this reason dried serum in large quantities is required for treating the burn casualties inflicted upon our expeditionary forces.

Blood transfusion is never advisable in the early stages and is only of value three or four weeks after the burn has occurred if the patient has secondary anæmia associated with severe sepsis. Although the immediate reactions of these cases may be disturbing, the ultimate effect is beneficial. It is wise to aim in these cases to keep the hæmoglobin at about 70 per cent (Haldane) by repeated (weekly or twice weekly) blood drip transfusions of about 1 litre, administered at the rate of 100 c.c. an hour. Fresh blood, taken from donors of the same group as the patient and individually matched with his serum, yields more satisfactory results than stored blood from a universal donor.

Desoxycorticosterone acetate (Ciba) 5 mgm., two hourly, intravenously or intramuscularly, or an adrenal cortical extract, such as *Cortin* or *Eucortine* 10 c.c. has yielded encouraging results in the treatment of secondary shock and toxæmia in the hands of some surgeons. A sufficiently long and adequately controlled series of cases treated by this method has yet to be published to prove the efficiency of the treatment. In theory the premises are sound, but the expense of the treatment makes it difficult to use as a routine at present. The most striking feature of secondary shock and toxæmia is the circulatory failure. The systolic and pulse pressures fall whilst the diastolic rises. The similarity between ordinary surgical shock and adrenal insufficiency has been known for some time. The blood changes after burns have been investigated by Wilson and Stewart [3] (1939). They found that the serum sodium falls while serum potassium, non-protein nitrogen and urea nitrogen rise. There is also increased corpuscular concentration and the serum chlorides fall. They believe that circulatory failure is not due primarily to the low serum sodium level and desoxycorticosterone acetate (D.O.C.A.), although it rapidly restores the normal sodium level, has only occasionally an effect in improving circulatory efficiency in severe toxæmia.

DIET.

Fluids to the limit of the patient's capacity are given by mouth in the early stages. If the patient begins to vomit, a plasma infusion is started at once.

Glucose should be administered freely in the form of sweets or as sweetened drinks of varying flavours such as hot weak tea, orange, lemon, grape-fruit, or lime juice. Liver injury caused by toxæmia is reduced materially if a store of glucose has been accumulated.

Sodium Chloride.—Common salt is given in the form of 15 grain capsules and also mixed with the patient's meals in order to make up for the loss of sodium chloride which has been found to occur in all cases suffering from burn toxæmia. It also serves to increase the patient's desire for fluids.

Vitamins A, B and C are specially prescribed during the stages of established infection.

(b) Local Treatment.

Since Davidson [4] of Detroit introduced the method fifteen years ago, the treatment of burns by a process of tanning has been adopted as a routine in most hospitals. The treatment is not ideal by any means; the number of modifications which have been introduced from time to time bear testimony to this but yet they have all failed to solve the problem. The hard unyielding cover tends to obscure collections of pus which may accumulate beneath it and in some parts actual constriction of the tissues may occur. It has recently been proved that tannic acid treatment is absolutely unsuitable for severe burns of the hands and face. In the absence, however, of a better method it is still applicable in burns of the trunk, arms and legs.

(1) Trunk, Arms and Legs.

Method of Tanning.

- (i) Tannic acid 20 per cent.
- (ii) Tannic acid 10 per cent and silver nitrate 5 per cent.
- (iii) Triple dye or gentian violet.

Tannic Acid 20 per cent.—Under gas and oxygen anæsthesia careful but gentle cleansing of the burnt area is carried out using swabs soaked in warm acriflavine lotion 1 : 1,000. Only if the affected areas are contaminated with oil or grease is cleansing with ether advisable. Rubbing and scrubbing are most harmful because such trauma causes an increase of exudation and shock. After the dirt and dead skin covering the blisters have been removed, a freshly prepared solution of tannic acid 20 per cent with acriflavine 1 : 1,000 is applied with gauze or a spray to the raw areas. It should be an invariable rule to cover the patient's eyes with pledgets of moist wool before any form of tanning is undertaken because a drop of the tanning solution accidentally splashed into the eye may cause irreparable damage. Between each application the tanned area is dried by an electric hair-drier. When the 20 per cent solution is used a suitable eschar can be produced by three or four applications in the theatre. The original technique in which a 2.5 per cent solution was used has now become obsolete because it took at least twenty-four hours to produce a satisfactory tan.

Tannic acid 10 per cent followed by silver nitrate 5 per cent (or tannic acid 5 per cent and silver nitrate 10 per cent).

The technique and end-results of this method closely resemble those of tannic acid 20 per cent except that after applying and drying the first coat of tannic acid a silver nitrate solution is used to complete the formation of the eschar which is darker than the one produced by tannic acid alone.

Triple Dye (Brilliant green 1 : 1,000—neutral acriflavine 1 : 1,000—gentian violet 1 : 1,000) or *Gentian Violet*.

These solutions are useful when, owing to the condition of the patient (e.g. "Blast lung") it is not advisable to administer a general anæsthetic for thorough toilet. The patients can be treated in their beds in the ward. The dye is applied after the loose skin over the blisters has been removed. The patients often complain of a stinging pain when the dye comes into contact with the raw areas and for this reason some surgeons apply a weak solution of cocaine before applying the dye. The resulting eschar is thin and pliable but it seems doubtful whether the dye, when combined with the tissues, will exert any lethal effect upon bacteria which lurk beneath it.

After-care of the Tanned Area.—A tan, however produced, should be covered by a sterile sheet without any other dressing and should be examined once every twenty-four hours as fresh blisters often appear round the periphery. The loose skin over these should be removed and triple dye applied at once. It is wise also to apply sulphanilamide powder each day to the edges of the tan and to any cracks that may appear near its centre. If the tan has not separated after three or four weeks it is usually advisable to remove it by soaking it in hypertonic saline solution or to cut it away with scissors while the patient is in a bath. Secondary or late tanning of an infected burnt area is extremely dangerous and should never be undertaken in any circumstances.

(2) *Hands and Face.*

(a) *Hands.*—Tannic acid treatment for severe burns of the hands is now whole-heartedly condemned by the majority of surgeons with experience of these cases. Patients with severe burns of the hands, if treated by tannic acid, may develop ischæmic necrosis of the fingers. This is caused by the œdema which develops between the fourth and sixth day beneath the rigid casing. Serious embarrassment of the digital circulation follows, causing contractures and atrophy of the fingers. We have frequently seen patients with hands affected by trophic changes similar to those that appear after section of the lower cord of the brachial plexus (fig. 1 and 2). The fingers are spindle shaped, cold, blue and stiff. The skin is shiny and the nails are curved and brittle. Complete necrosis and loss of the terminal segments of the fingers have been noted on various occasions. For these reasons tannic acid must never be applied in the treatment of severe 2nd and 3rd degree burns of the hands.

Saline baths alternating with frequent saline dressings is the treatment advised. Patients enjoy putting their hands into the bath because pain is relieved and they can start early movements of the fingers. The rim of the bath must be rounded and carefully padded with sorbo or sponge rubber

in order to avoid pressure upon the forearm. The sponge rubber pad is not attached to the rim of the bath so that it can be boiled each day before use.

Patients sometimes, however, complain of slight stinging pain when their hands come out of the bath. This is caused by the drying out of salt



FIG. 1.—Effects of burns of the hands sustained during aerial combat.



FIG. 2.—Trophic changes following tannic acid treatment of severe burns of the left hand.

from solution and can be prevented if the saline is rinsed off in a bowl of sterile water after the bath. Between the baths the dressings are kept moist with saline solution. If it is found that the dressing does not float off easily in the bath, *tulle gras* [5] may be applied to the wound beneath the saline

dressing. This latter dressing can be replaced frequently without disturbing the *tulle gras*. Special jaconet or transparent silk bags (Surgeon Lieutenant Commander J. Bunyan [6]) may be worn over the dressings to keep them moist. These are especially useful when the patient is being transferred by ambulance from one hospital to another.

(b) *Face*.—Tanning is not a satisfactory method of treating burns of the face. Continuous irrigation or frequent saline compresses are preferable.



FIG. 3.—Saline bath treatment used for severe burns of the hand.

Irrigation can be arranged if a thermos reservoir containing warm saline solution is fixed above the patient's head. Fluid is dripped on to the face by means of a rubber tube with a drip feed. The position of the tube is changed frequently by the nurse or the patient himself. A water-tight jaconet collar (Gillies [7] 1940) is attached round the patient's neck. A metal rim raises the periphery of the collar so that the water collects in the intermediate portion and can be drained away by a tube into a bucket at the bedside.

Another trial is being made of the old method of treating extensive burns

of the trunk by continuous or frequent body immersion baths (McIndoe, 1940). A specially heated bath¹ is fixed near the bedside or the bed may be placed in the bathroom. Brown and Blair [8] of St. Louis have been using this method with great success in the treatment of severely burnt children. Ordinary soap and water solution is used in their baths instead of saline. Bacteriologists have shown that soap and water is lethal to most hæmolytic streptococci and so the rationale of the treatment is sound. It may be that in the near future tannic acid treatment of every type of burn case will be abolished ; at present, however, owing to the practical difficulties of treating



FIG. 4.—Gillies collar in use for saline irrigation of the face of a burnt fighter pilot.

large numbers of severely ill patients by the immersion method, its widespread application as a routine measure is not advisable but its value is established in the treatment of severely infected cases which are seen so often in the third or fourth week after a tan has been applied. *The immersion bath is the ideal method for removing an infected tan.*

¹ 110° F. in reservoir, continuous flow at 105° F. keeping the saline solution in the bath at 100° F.

Skin-grafting.—Most extensive 2nd degree burn cases and all 3rd degree cases require some type of skin-grafting procedure to make good the skin loss. Grafting may be advisable during three periods :

- (i) Before the burn has healed to prevent contracture and accelerate healing.
- (ii) When deformities are present after the burnt area has healed but before the contracting phase is over.
- (iii) To cure deformities after the contracting phase is over (six months to a year after the burn).

In the first period it is impossible to render large open granulating wounds aseptic and there must always be an element of doubt about the success of the graft. This risk can be reduced considerably if especial care is taken to prepare the granulations for grafting and to avoid applying a graft until the recipient area is fit to accept it. It is essential to wait until the granulations are flat and a bright red colour. It is useless applying a graft when the granulations are pale and oedematous and if there is an excessive discharge from the wound. Cultures should be taken from the raw area 24 to 48 hours before the graft is applied, because if *Bacillus pyocyaneus* or hæmolytic streptococci are present, it is unwise to apply a graft. Frequent bathing with saline and eusol and a moderate degree of pressure between dressings help to improve the condition of the granulation tissue. Sulphanilamide powder applied locally is useful to remove hæmolytic streptococci or to prevent them infecting the grafted area afterwards. Thin razor grafts with many small holes perforated in them are the most satisfactory in this stage. It is essential to fix them firmly to the raw area and it is advisable to apply moderate pressure. The grafts are fixed most satisfactorily by suturing their peripheral margins to the edges of the defect using *tulle gras* to hold the grafts in position according to the Gillies technique. Frequent saline dressings should be applied over the *tulle gras* after the first forty-eight hours.

In the second period half-thickness as well as Thiersch grafts may be used with success as the danger of infection is much reduced. The immediate "take" is satisfactory in nearly all cases but, as contractures occur in and around the grafts after they have been imbedded, it is quite often necessary to insert more skin at a later date if the deformity tends to recur. The best example of the need for grafting in this stage is when ectropion follows burns of the eyelids. It is essential to repair the deformity as soon as possible to protect the eye but it is often found that, after a month or two, more skin is required and another operation has to be undertaken.

Repair in the third period is the most reliable and precise because an accurate estimate can be made of the tissue-loss and the amount and type of skin required for replacement. All kinds of graft may be used at this time ; Wolfe grafts, if the donor site is carefully chosen, give better cosmetic results than razor grafts and, if the contours have been affected, tubed pedicle grafts containing subcutaneous tissues may be used.

A War Complication of Burns.—"Blast lung" in various degrees of severity is often associated with severe burns when these have been caused by the "flash" from bomb explosions. The complication is latent in many cases and is obscured by the other symptoms. Hæmoptysis is rarely present to call attention to the lung injury. An X-ray examination should be carried out in all doubtful cases. Areas of subpleural thickening or of fine mottling throughout the lung-fields denote subpleural or intra-pulmonary hæmorrhages. If a "blast lung" injury is present the administration of a general anæsthetic for cleansing of the burns is fraught with increased danger.

Bacteriology.—The majority of 2nd and 3rd degree burns become infected by hæmolytic streptococci. In nearly every case these organisms can be cultured from the weeping cracks or edges of the tan or from the uncovered granulations. It is therefore advisable to give full doses (1 grm. four-hourly) of sulphanilamide if there is any rise of temperature, redness near the edge of the tan, or if hæmolytic streptococci are found in the discharges. Cultures from the unhealthy granulations which often result from severe 2nd and 3rd degree burns usually reveal the presence of *Bacillus pyocyaneus* as well as various types of streptococci and staphylococci. The discharge is green and a distinctive sickly odour is perceptible. Sulphanilamide powder applied twice daily and covered by a layer of *tulle gras* and then a saline dressing has been found useful in many of our cases. The powder is applied by means of an insufflator or from an ordinary pepper-pot in much the same way that sulphanilamide powder is applied locally to war wounds to protect them from hæmolytic streptococci.

Conclusions.—The ideal treatment for cases of severe burns has not yet been discovered. Minor cases of burns yield satisfactory results following almost any form of intelligent treatment. Tannic acid treatment for severe burns of the hands is often more dangerous than the burn itself. Oedema occurs beneath the rigid casing and causes constriction, ischæmia and pressure atrophy of the fingers. Sometimes the terminal segments become necrotic and drop off.

Frequently repeated saline baths should be used for 2nd and 3rd degree burns of the hands and face. At present, in the absence of a better method, coagulation by tannic acid or triple dye is still advisable in severe burns of the trunk and limbs. Sulphanilamide in full doses is required at some stage of the treatment in most cases of extensive burns because nearly all become infected with hæmolytic streptococci.

Plasma in large volumes is extremely valuable in the early stages of primary shock. The volume of plasma required depends upon the hæmoglobin percentage of the blood.

I am indebted to Sir Harold Gillies and to Colonel L. Colebrook for their advice and criticism.

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TREATMENT OF BURNS IN WAR-TIME.

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AND

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As there still appears to be considerable controversy regarding the most satisfactory method of treating burns due to enemy action, we propose to describe the method used in a recent series treated in a military hospital.

During the evacuation from Flanders, a military hospital in England was converted into a C.C.S. to deal with the more seriously wounded cases. Twenty extensive second and third degree burns were dealt with. The less extensive burns and scalds are not considered in this communication.

Eight sailors were admitted within three hours of their injury, sustained from an explosion on board a destroyer. The burned areas ranged from 40 to 70 per cent of the body surface and were complicated by gunshot wounds of the limbs, skull and pelvis. Our mortality was 60 per cent—five of the patients dying of severe toxæmia aggravated by their wounds. No first-aid treatment was administered before admission apart from the administration of morphine.

The other twelve cases were British and French soldiers burned by incendiary bombs and shells. Several had been immersed in the sea for several hours, others had rowed small boats, although the epithelium was completely denuded from their palms. Two had been treated with tannic acid and morphine, six with dry dressings and morphine, and the remaining four received morphine only. Twenty-four to ninety-six hours had elapsed since their injury before they were admitted to hospital.

This small series is considered as a whole as these patients were under treatment simultaneously. More recently we have had to deal with R.A.F. casualties severely burned in blazing planes. The methods used were as described below but the first group is taken as a basis for this article as it is unusual for a hospital to have so many cases of this type to deal with at one time.

To reduce the incidence of sepsis and to facilitate nursing, all severe burns were isolated in one ward. Large shock cradles were improvised by the Garrison Engineer within a space of several hours and the ward was kept at a temperature of about 72° F. A special staff of sisters (Q.A.I.M.N.S.) and V.A.D.s were detailed to attend only to the burns.

Fourteen cases were suffering from severe secondary shock or toxæmia and these were treated in the theatre as soon as possible after admission. The others naturally yielded in precedence to the other urgent casualties but all were treated within twelve hours of admission.

Routine Theatre Treatment.—The temperature of the operating theatre was raised to 80° F., and the most severely injured men were anæsthetized with nitrous-oxide and oxygen. A separate paragraph will be devoted to the anæsthetic problem.

The standard technique was as follows :

The injured surface is gently cleansed with swabs wrung out of warm saline and all dirty and blistered epithelium removed. When particularly dirty or oily, ether soap and ether are used for cleansing. A 1 per cent watery solution of gentian violet is then painted over the raw surface by means of gauze. Apart from its antiseptic and coagulating action, this solution clearly demarcates the raw area. The surface is dried by a current of hot air from an electric hair-dryer. Using gauze, a freshly made 10 per cent solution of tannic acid is now applied and, while still moist, the area is painted with a 10 per cent solution of silver nitrate applied in the same manner. Immediate coagulation takes place and the area is again dried by hot air. A further application of gentian violet is made, particular attention being paid to the edges of the damaged area.

On returning to the ward, the patients were nursed under a shock cradle. As a routine, the coagulum was dehydrated four-hourly with methylated ether, and painted with 1 per cent gentian violet in spirit. Areas which appeared moist or thin were treated hourly if necessary. Burned hands and arms were raised on pillows to reduce cedema.

In four very ill patients, this modified Bettmann's technique was replaced by the application of gauze rolls soaked in 20 per cent tannic acid to shorten the time spent in the theatre. The burned areas were rapidly cleansed under gas and oxygen and the gauze quickly applied. This method was not adopted as routine as the coagulum is not open to inspection and moistening can occur unnoticed with an increased risk of toxæmia.

Anæsthesia.—Severe burns were considered sufficiently serious to require the attention of an experienced anæsthetist, taking precedence in this respect over many other injuries.

Gas and oxygen was the anæsthetic of choice on account of the risk of increasing toxæmia by the use of chloroform or ether ; for the same reason evipan and pentothal were considered unsuitable as being liable to increase liver and kidney damage.

In practice no difficulty was found in securing comfortable induction even in the worst cases of facial burns. Several patients were so extensively burnt that there was no part of the body where venipuncture could have been performed for the administration of an intravenous anæsthetic.

The technique of anæsthesia was as follows :

A standard Boyle's apparatus was used. An ordinary face pad with mouth hole was saturated with warm water and was laid gently on the face. This caused no complaint of discomfort and allowed an airtight fit of the face-piece without pressure. Owing to the presence of shock, unconsciousness occurred with five or six breaths of pure nitrous oxide. In about a

third¹ of the cases relaxation was complete enough with gas and oxygen to permit the passage of an intratracheal tube *via* the nose into the trachea. In the remaining cases a few breaths of gas bubbled through the chloroform bottle allowed of the passage of the tube. The pharynx was then packed off with damp gauze to ensure an airtight fit of the tube and gas and oxygen anæsthesia was continued throughout the operation.

In nearly all the patients the whole face and hands were uniformly burnt so that there was no possibility of judging the degree of oxygenation of the blood. The colour of the conjunctivæ was bright pink under all circumstances, leading us to believe that the explosion causing the burns had released considerable quantities of carbon monoxide. Under these conditions to provide a steady quiet anæsthesia with gas and oxygen was difficult even after the insertion of an intratracheal tube. On those occasions when a supplement was needed chloroform was used in preference to ether. This choice was made with the full realization of the theoretical factors involved in regard to the possibility of toxic damage to the liver. In several cases nothing but gas and oxygen was needed. In the others, to facilitate the passage of the intratracheal tube, a deeper level of anæsthesia was needed momentarily. Occasionally too, during an operation lasting perhaps an hour, a dangerously light level of anæsthesia would occur. At such times a few breaths of gas, which had been gently bubbled through chloroform would establish the required level of anæsthesia. Were ether used in such circumstances the result of one or two breaths would be to start the patient coughing or heaving, necessitating full saturation with ether before quiet could be restored. Ether is a poor adjuvant to gas and oxygen since so often its attempted use in small quantities ends in a full ether anæsthetic being administered, the nitrous oxide playing very little part at all, except as a vehicle.

Ward Treatment.—This is best discussed under the headings of Secondary Shock, Toxæmia, Sepsis and Healing. *Primary Shock* was not seen in this series.

Secondary Shock.—Secondary shock was marked in several cases and blood-pressure readings were considered along with the clinical assessment of the patient's condition. If the blood-pressure did not rise after a short period under the shock cradle, combined with the administration of fluids and morphine, early coagulation usually arrested the progress of the shock. Intravenous administration of fluid was rarely necessary as almost all patients consumed and retained enormous quantities of fluids and glucose. When necessary, fluid was administered rectally and intravenously. Desoxycorticosterone acetate was administered in 5 mgm. doses intramuscularly, usually four-hourly. The preparations used were Percorten and D.O.C.A., generous samples of which had recently been supplied to us by the manufacturers (Ciba, Ltd., and Organon Laboratories, respectively). The periodicity was based on the usual signs of shock supplemented where possible by repeated blood-pressure readings. A low diastolic reading was

considered a more pressing indication for the corticosterone than a low systolic reading.

Toxæmia.—We have no certain knowledge of the source or constitution of the toxic substance but we do know that it causes central necrosis of the liver lobules and that it alters the blood chemistry in a way that suggests damage to the suprarenal cortex. Thus coagulation may inhibit the out-pouring of toxin from the damaged surface; glucose will help to support the liver and the synthetic corticosterone frequently reverses the changes in blood chemistry.

Toxæmia was present in some cases on admission and these were dealt with by early coagulation. Where toxæmia developed after coagulation, attention was directed to moist or thin areas of the coagulum. Fluids and glucose were forced and fluid intake and output charted. Desoxycorticosterone acetate was administered in 5 mgm. doses intramuscularly and the periodicity here was judged by a careful chart of hourly pulse, temperature and respiration readings. The 5 mgm. were given every two or four hours according to the severity of the toxæmia. The common features of toxæmia which arose were sustained pyrexia, restlessness, rapid pulse and respiration rates (simulating pneumonia), hiccough, vomiting (once blood-stained), delirium and coma. The blood-pressure did not fall until the condition was well established. No blood chemistry investigations could be carried out. Owing to the difficulty of obtaining sufficient synthetic corticosterone, Eucortone (the suprarenal cortical extract made by Allen and Hanbury) was used in some of the cases. Large doses were required and the results were not so dramatic as in the cases in which the synthetic preparation was used.

Unfortunately no necropsies were performed in the five cases that died of severe toxæmia.

Sepsis.—Sepsis was never serious and in no case was the tannic acid regime terminated from this cause. Where necessary, the coagulum was incised, dried and painted with the gentian violet in spirit. In two cases, the coagulum was removed entirely from septic areas and, after cleansing, tannic acid was applied again with a satisfactory coagulum resulting. No sulphonamide was required in this series, although we have proved its value in civil life when severe sepsis ensues.

Healing.—As a rule the coagulum should be left until it strips off readily—usually at the end of the second week. In deep burns the coagulum may take many weeks to separate but unfortunately, in this present series, the cases had passed to another hospital before the coagulum had entirely separated and we have no knowledge of the ultimate result as regards healing of all areas.

It is our practice to treat clean raw surfaces with cod-liver oil or an ointment such as Trinity Ointment (eucalyptus, zinc-oxide, lanoline and soft paraffin). The healing of large raw areas is expedited by the use of Thiersch grafts, and whole-skin grafts may be necessary.

By careful attention to the flexures from the outset and appropriate splintage where necessary the incidence of contractures can be minimized.

It is not unlikely that tannic acid will prove unpopular in many circles in the near future. The efficiency of the tannic acid method depends largely on the time which has elapsed between the actual injury and the treatment and on the thoroughness with which cleansing is carried out before coagulation is attempted. In wartime it is easy to visualize circumstances interfering with both these factors and many imperfect "tans" will occur.

In spite of this, we hope that coagulation will still be adopted as a first-aid method, even in the absence of facilities for thorough cleansing. Even imperfect coagulation will lessen the risk of shock and toxæmia.

The choice of a coagulant is a matter of personal experience and the method described in this article has been used in 300 cases of moderate and severe burns and scalds with gratifying results.

We wish to thank Colonel J. E. M. Boyd, *M.C.*, who was in command of the hospital, for his help and encouragement throughout.

THE ASSESSMENT OF FUNCTIONAL RECOVERY AFTER WAR WOUNDS OF THE LIMBS.

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THE degree of functional recovery after war injuries is not determined and recorded accurately in many massage clinics.

In wartime, when the number of such injuries is greatly increased both in military and civil practice, some attention to this aspect of after-treatment may be desirable.



FIG. 1.—The instrument for measuring the degree of flexion and extension and inversion and eversion, and the power of flexion and extension and inversion and eversion at the ankle-joint.

In wounds and injuries of the extremities, the disability is broadly speaking due either to pain, loss of movement, or loss of power.

Pain is relative, and in common practice cannot be measured. Its

disappearance is as a rule concurrent with return of power and freedom of movement.

The range of flexion and extension may be measured by means of a measuring calliper before or after each treatment and a record of this in the patient's notes is helpful. There are other movements equally important, which are less easily measured, and for which the measuring calliper cannot be used.



FIG. 2.—Showing the horizontal arm pieces and the graduated disc behind. In this case abduction of the left arm is being measured (power of) and the spring balance is seen below the limb, and attached to the lower part of the frame.

Apparatus capable of recording accurately both the range of movement and the power in the various joints may be manufactured at very little cost. It is simple in construction and easy to operate.

In principle it consists of an instrument hinged at the level of the joint with a movable part to which is attached an indicator recording on a scale graduated in degrees. The power in pounds resistance is recorded by a spring balance which is attached by pulleys to the movable part and to the framework (figs. 1, 2 and 3).

This apparatus should form part of the equipment of a wartime Hospital Massage Department and be kept in a small room set aside for that purpose, where the patient goes before or after each treatment and where the functional efficiency of the limb is carefully measured and the figures entered in some form of case sheet (fig. 4).

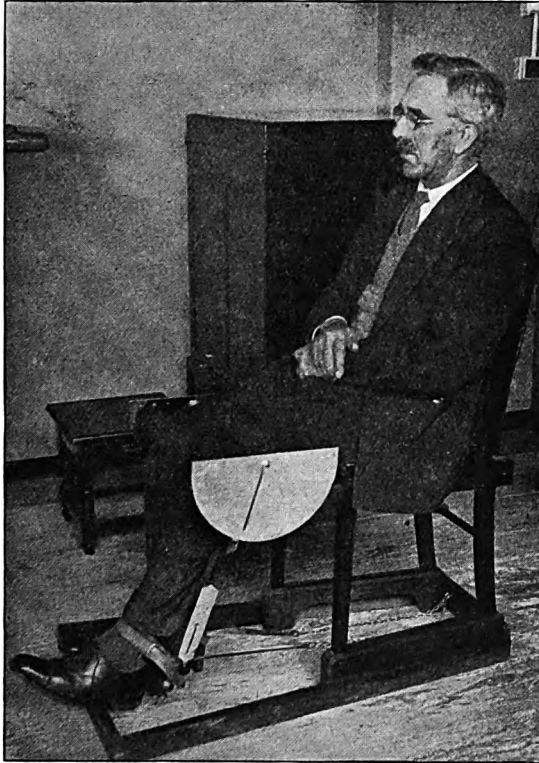


FIG. 3.—The detachable spring balance may be seen immediately above and behind the ankle. In this case the power of active extension is being measured and the spring balance is connected to the back of the lower part of the frame on which the chair rests.

One that has been found to be efficient consists of a simple folder with four pages. The first is for the history of the case, age, sex, whether right or left handed, etc. The lower half of the page is blank, and here the dates of attendances and the treatment ordered by the surgeon are entered.

The second page contains a column for the date and the treatment given by the masseuse, a second column for the range of movement in degrees, subdivided into columns headed Pronation, Supination, Flexion, Extension, Abduction, Adduction and Rotation. A third column headed Pounds Resistance and similarly subdivided into columns headed Pronation, Supination, Flexion, Extension, Abduction, Adduction and Rotation.

At the bottom of the page is a space headed *Normal*, in which measurements on the unaffected side are recorded for comparison.

The third page is for a record in graph form (fig. 5), in which the measurements on the affected side are plotted in black ink, and on the sound side in red ink. By this graph the return of function both in range of mobility and power may be seen at a glance.

The fourth page is for special remarks, details of electrical tests, and other special information.

At first sight it might appear that considerable additional labour would be thrown upon the masseuse who is responsible for keeping these records. Actually in practice once the initial difficulties connected with the use of

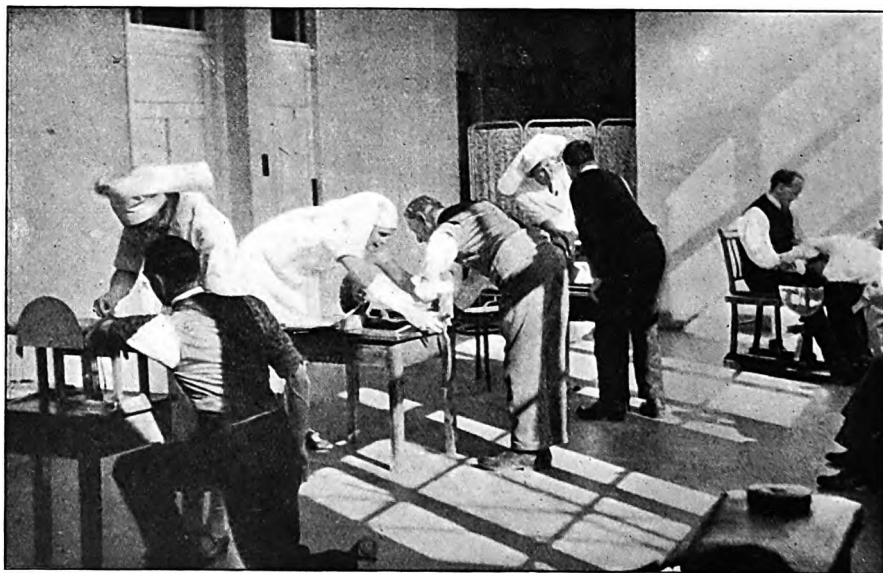


FIG. 4.—The function of the limb is determined and recorded by the Masseuse before or after treatment, and carefully recorded.

strange apparatus is overcome, everything runs quite smoothly and the masseuse ultimately becomes so skilled that the whole thing takes only a few seconds to complete.

At first perhaps a little reluctant to undertake this administrative work, it is interesting to watch the change in attitude as she realizes that the extra labour more than repays her. She is encouraged for she can see at once the progress that the patient is making under her treatment, which may be slow, and unless measured accurately and recorded in this way, may not be obvious to the naked eye.

The patient has no access to his notes, but nevertheless cannot be completely divorced from his surroundings and becomes alive to, and interested

in, his own progress and encouraged by the figures which he cannot help but see. His co-operation, such a valuable factor in treatment, is thus obtained.

If progress lags or is not maintained it becomes at once obvious and the masseuse is then instructed to refer the case to the surgeon, who detecting the need for some more active form of assistance, may save valuable time and spare the patient many unnecessary weeks in the hands of a too persevering or optimistic masseuse.

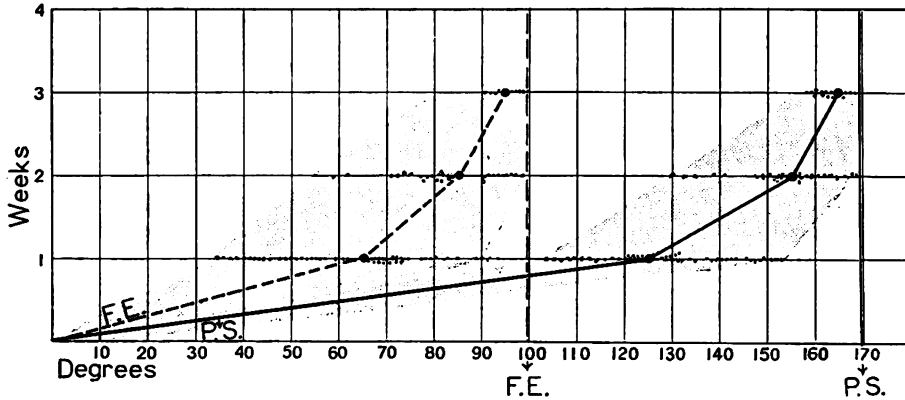


FIG. 5.—The return of function in Graph form. The continuous line represents the range of flexion and extension at the wrist joint, the interrupted line the power in pounds resistance of pronation and supination after a Colles' fracture of the wrist. The shaded areas represent normal variations (56 cases).

As convalescence is reached the date at which the patient is fit to resume duty will depend largely upon the type of work he will be called upon to do. In some doubtful cases the degree of functional return as recorded in his graph may simplify the work of the Surgical Specialist upon whom such a decision devolves. Sometimes the patient may be returned to his unit much sooner than would otherwise have been deemed advisable on a superficial examination performed during the course of an ordinary consultation.

Finally, the degree of permanent disability is indicated as a numeral, and this is invaluable when the question of medical boarding and regrading arises or when the question of pensions has to be considered.

RHEUMATISM IN THE ARMY AND THE RATIONAL CAMPAIGN AGAINST IT.

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THE problem of rheumatism in the Army differs somewhat from that of rheumatism in civilian life. In the Army soldiers do work of practically the same type under the same climatic and environmental conditions. The age groups are balanced to youngsters and adults and there are hardly any old soldiers. On the other hand in civilian life are two main groups, the manual labourer and the office employee, and there is large divergence in ages and conditions of housing and feeding. In the Army the men are usually a good healthy type, they are continually under medical supervision and consequently diseases if any can be diagnosed at an early stage. It should be remembered that there is the possibility of conscious or sub-conscious simulation of diseases. The problem has also to be looked at from a financial standpoint in the event of soldiers being invalided out of the Service with such conditions as rheumatic heart or chronic joint conditions which render the invalid unable to take up civilian work. Acute rheumatic fever does not represent difficulty in diagnosis. The high temperature, periarticular change in the form of swelling and redness of the skin over the affected joints and the general condition of the patient, complete the picture and are sure indications that the patient should be in hospital. More difficulty may be met with in cases of subacute rheumatic fever, in which the rise of temperature may be small and not continual, so that, at the moment of examination, there may be a normal temperature. The articular changes are not very marked, there may be no periarticular swelling and no redness of the skin over the affected joints. The diagnosis in fact is based entirely on subjective symptoms such as history of joint pains. Such cases are often not diagnosed correctly. A mistaken diagnosis in such cases may be of great import and even lead to serious consequences. The intensity of the rheumatic infection cannot be judged from the intensity of the objective or general signs. Rheumatic fever is not a joint disease but a general disease which attacks more often the central circulatory system, i.e. the heart, in the form of endo-myo-pericarditis and sometimes even a pancarditis; mostly endo- and myocarditis together. Not infrequently the conducting system of the heart is involved. Quite frequently we find rheumatism as exclusively a heart condition without the involvement of the joints. This occurs mostly in young individuals, rarely over 25 years of age. In these cases the early diagnosis of rheumatic heart disease is of primary importance, especially from the point of view of prognosis. In these instances very often the signs and symptoms, especially at an early stage of

the disease, are not very marked. They may simply be fatigue, slight weakness and tachycardia. Such signs and symptoms may easily be attributed by an inexperienced medical officer to the new conditions of service to which a recruit has not been accustomed before. In such cases, if we have the slightest suspicion, we may make a correct diagnosis after a few days' observation in a detained ward. If possible a sedimentation rate test should be made, also a total white and differential blood-count. In every case an accelerated sedimentation rate (S.R.) is sufficient indication for further observation. Where an acceleration of the S.R. is found and rheumatism suspected, further investigations are indicated such as X-ray electrocardiography.

More rarely we meet cases of chronic joint inflammation, rheumatoid arthritis. This disease presents some difficulty in early diagnosis because the early symptoms may not be very marked, they may present themselves in the form of vague pains in the small joints of fingers, toes, wrists, elbows, knees, etc. Sometimes there are small periarticular swellings of joints without redness of the skin and without any rise of temperature. There are no heart symptoms beyond some tachycardia. The liability to miss the diagnosis with consequent serious results for prognosis and treatment is very evident.

Osteoarthrosis, usually called in this country osteoarthritis, nearly always affects the big joints, the hips, knees and shoulders, and is mostly unilateral. This disease is hardly ever met with during the normal age of the soldier and, if found, the arthrotic changes are so small that they do not interfere with normal duties. When osteoarthrosis is suspected and bone changes discovered after physical examination, and possibly confirmed by X-rays, the question arises whether such changes are likely to interfere with the soldier's future efficiency. We meet sometimes cases in which there is great disproportion between the subjective and the objective symptoms. While some patients complain of much pain and discomfort they present on examination very little arthrotic change and limitation of joint movements while others do not suffer any pain and very little discomfort but are found on physical examination to have a certain degree of limitation of movement with considerable arthrotic change on X-ray examination. Osteoarthrosis is a local disease and the condition of the affected joint is the only deciding factor as to efficiency for military service.

Another disease which may be met with is spondylitis ankylopoietica (spondylitis adolescens). This is a very chronic disease of the rheumatic type which affects the joints of the vertebral column and is fortunately comparatively rare. The early symptoms are rather vague and polymorphic. They may present themselves as insidious intercostal neuralgia or sciatica or intermittent myalgia, which on careful examination is found to be secondary to a primary spondylitis ankylopoietica. If this disease is diagnosed, the individual should be rejected as unfit for military service, as spondylitis ankylopoietica is a progressive disease affecting the intervertebral

and the costo-vertebral joints with subsequent interference with thoracic movements. Not infrequently they are in the form Pierre-Marie-Strümpell (spondylose rhizomélique) the large joints such as the hips or shoulders, being involved.

The remarks made above in respect of osteoarthritis regarding liability for military service apply also to spondyloarthritis deformans in a greater degree, because here we find marked and widespread hypertrophic changes which are not limited to one vertebra alone. The subjective symptoms may be nil. The X-ray picture may present considerable lipping of the vertebral bodies which will not be considered of great pathological importance unless an inflammatory process is also present. The differential diagnosis can be arrived at by careful observation, white blood-count, differential count, and especially S.R. An accelerated S.R. is always indicative of an inflammatory process in such cases.

Acute muscular rheumatism may be generalized or localized. Most often it is found in the neck-muscles (torticollis rheumatica) and the lumbar region (lumbago) but also in the muscles of the thorax (pleurodynia). Chronic muscular rheumatism is doubted by many authors and the large number of terms used to describe it, fibrositis, panniculitis, cellulitis, cellulalgia adiposalgia, etc., go to show that not even the locality of the pathological process is agreed upon. Chronic muscular rheumatism *per se* is of small import as regards military service except that it must be borne in mind that this condition may be a secondary symptom to a primary organic cause, such as new growths of bones, inflammatory conditions of bones, arthritic changes in the intervertebral joints or even ureteric calculi.

Of great importance on account of frequency are the rheumatic conditions of nerves, especially the sciatic nerve. Sciatica may be acute or chronic and may be neuralgia or neuritis of the sciatic nerve. In neuritis we find, beside the pains, trophic changes, disturbances of sensibility and abolition of tendon jerks. Sciatica may be radicular, funicular or peripheral and according to the locality of the morbid process the symptoms may be different. In acute sciatica marked by severe neuralgic pains, sometimes with inability to walk, the patient should immediately be admitted to hospital. In chronic sciatica symptoms are very polymorphic, varying from slight temporary pains to permanent disability. In severe cases patients should be admitted to hospital so that accurate diagnosis may be made as to whether the condition is an essential sciatica or a symptomatic condition (ischialgia) secondary to malignant disease, hypertrophy of prostate, spondylitis adolescens, etc. For a long time sciatica has been known as one of the diseases that a malingerer is likely to copy. The knowledge of objective symptoms, such as the symptom of Laségue, coupled with a history of pain, by a would-be patient is very likely to deceive the examining medical officer in view of the fact that, in sciatica, blood changes are not marked, the S.R. is usually normal, the X-ray rather indefinite and it is difficult to discover a simulator. A very careful examination of all the movements of the affected side compared

to the healthy will usually enable the physician to distinguish the true disease and a faked one. The non-rheumatic joint affections, chronic and acute, of the infectious diseases, such as measles, influenza, undulant fever as well as gonorrhoea, syphilis and tuberculosis, do not represent special problems of diagnosis and treatment.

The problem of simulation and aggravation of disease is a very serious one. The largest number of malingerers complain of rheumatism (pains) especially of muscles and nerves. The knowledge of this fact may sometimes lead us to suspect simulation where true disease exists. Such a mistake is very grave from the patient's point of view as, in such cases, the disease remains untreated, and takes on a chronic character making the individual a permanent cripple.

Rheumatism as a social problem was first recognized after the Ministry of Health Report, published by H.M. Stationery Office in 1924, "The Incidence of Rheumatic Diseases." Other countries in Europe and North and South Americas also recognized these diseases as a social problem. The large increase of rheumatic cases cannot be explained entirely by the fact that they are better diagnosed but may, perhaps, be attributed to conditions of warfare during the world war of 1914-18. Damp trenches, bad housing in barracks, bad clothing and food, all of these are predisposing factors to rheumatic diseases. Keeping in mind the crippling effect of these diseases, especially acute rheumatic fever with subsequent cardiac involvement, and chronic articular rheumatism with its lasting joint conditions, it will be realized how important it is that this problem should be recognized. Such recognition may save large sums of money which would otherwise have to be paid in disability pensions. In the present state of our knowledge of rheumatic diseases we are not in a position to take very effective prophylactic measures, such as might reduce to a minimum the incidence of these diseases. Our hope lies therefore in combating the condition in its early stages. I suggest firstly that rheumatic cases should be centralized under the care of specialists (rheumatologists). Medical officers in charge of units should send rheumatic cases to these special hospitals at once. At these hospitals careful examination should be made and a correct diagnosis arrived at. In cases of acute rheumatic fever the condition and function of the heart should be carefully noted.

The patients should not be discharged from hospital too early. The complete disappearance of such general symptoms as pain and joint swellings should not be regarded as a complete cure of the patient because frequently the morbid process goes on without any signs or symptoms. The deciding factor should be the sedimentation rate. The patient should not be discharged as cured until the S.R. comes down to normal, 5 to 7 mm. Westergren. When the S.R. has been normal at least twice in a week the patient may be sent to a convalescent home for three to four weeks and treated adequately. During this time of convalescence S.R. should be estimated once a week and, if it remains normal, the soldier may then be returned

to his unit. In cases in which the heart is involved in the course of acute rheumatic fever special attention should be given to the condition. Such a state, myo- or endocardial, should be regarded as a chronic and not an acute one. In the case of endocardial involvement the subject is no longer fit for military service. On the other hand, with myocardial involvements, the patient should be kept in bed for at least six to eight weeks. The leading factors in our treatment will be the patient's condition on physical examination and also blood examination, white cell count, differential count, S.R., the electrocardiogram and X-rays. When the patient is finally allowed to get up and to walk for a few minutes daily the heart condition should be checked by the Ekg. and the S.R. done. Return to normal life should be very slow and gradual, the patient being sent to a convalescent home after a normal S.R. and Ekg. He should stay there at least three months and his condition be controlled by physical examination, S.R. and the Ekg. In this way we may be able to cure a number of cases who will eventually be returned to their units as fit for military service. The rheumatoid arthritic cases depending on the intensity of their conditions may be sometimes able to return to duty. Cases of essential muscular rheumatism and some cases of acute sciatica are, after appropriate treatment, generally fit for military service, but cases of chronic sciatica may only be able to do light military duty.

All rheumatic patients must be kept for a considerable time on salicylates which have not only a curative but also a prophylactic action. The question of doses of sodium salicylate and other salicylic acid compounds and pyrazolon derivatives, the duration of treatment, the methods of giving the salicylates— orally, intramuscularly or intravenously—together with the question of surgical intervention for the removal of "infectious foci," as well as other forms of treatment, such as gold therapy, protein shock therapy of rheumatoid-arthritis, etc., constitute a chapter of medical study which requires a number of years to acquire.

Conclusions.—Having regard to the above, the problem of rheumatism as it affects the Armed Forces can be dealt with by accurate diagnosis and adequate treatment, preferably in a rheumatic hospital and at the hands of expert rheumatologists. From the results obtained in anti-rheumatic centres in peacetime I am confident that similar good results could be obtained amongst a military personnel during the present war.

Since writing this article the *British Medical Journal* for February 1, 1941, has published a report on the recommendations of the British Empire Rheumatism Council which are almost the same as my recommendations above.

THE PROPHYLACTIC TREATMENT OF VENEREAL DISEASE.

BY MAJOR J. M. OFFICER,
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VARIOUS methods of prophylactic treatment of venereal disease have been tried in the Army, but no comparative figures of results appear to have been published, so that the following account of the three methods used in China may be of interest.

In Hong Kong there are seven Preventive Ablution Centres and, until April, 1939, the treatment consisted of irrigations with potassium permanganate and the application of calomel ointment.

Soldiers were instructed to report to the nearest P.A. Centre as soon as possible after exposure to infection.

A regimental orderly was on duty at each centre and, when a soldier reported for treatment, he was instructed to cleanse the glans penis and adjacent genital area with antiseptic lotion, irrigate the anterior urethra with 1:10,000 solution of potassium permanganate, dry the parts and finally apply 33 per cent calomel ointment. On completion of these procedures he was given a ticket to prove that he had used the centre.

In April, 1939, protargol instillations were instituted in one of the centres in place of potassium permanganate irrigations, and this modified technique gave such encouraging results that by September its use had been extended to all except two centres.

The striking advantage of protargol instillations over potassium permanganate irrigations is summarized in the following table :

	Number using	Number who later developed V.D.
Potassium Permanganate Irrigations ..	1,288	160 (12·42%)
Protargol Instillations	1,918	20 (1·04%)

The newly adopted method of preventive treatment differed from that previously used in that $2\frac{1}{2}$ per cent solution of protargol was substituted for potassium permanganate irrigations, 5 c.c. of $2\frac{1}{2}$ per cent solution of protargol being instilled into the urethra and held for 15—20 minutes. In two of the centres the regimental orderlies were replaced by trained R.A.M.C. orderlies.

In the meantime, there were complaints from the troops that the protargol instillations were painful, and in consequence there was a decrease in the number using the centres and a corresponding increase in the number of cases of venereal disease.

In 1938, before the introduction of protargol, 15,430 used the centres, whereas in 1939 only 9,767 used them.

On March 1, 1940, the treatment in the centres was simplified. Irrigations and instillations were no longer used, as it was considered that any

antiseptic sufficiently strong to destroy the gonococcus was likely to damage or devitalize the delicate urethral mucosa.

The treatment adopted therefore consisted in thorough cleansing of the penis and parts around with soap and water, followed by swabbing with 1 : 10,000 solution of hydrarg. perchloride; micturition in gushes and the application of calomel ointment. No lotions or ointment were introduced into the urethra.

Although the percentage of cases developing gonorrhœa after this treatment proved to be the same as amongst those who had used protargol, there were two favourable indications in the results, viz. there was a distinct reduction in the total number of venereal infections and fewer cases were admitted suffering from venereal disease after failing to carry out prophylactic treatment. The results of the introduction of the simplified method of prophylactic treatment may therefore be regarded as encouraging in these respects. The following table illustrates these points:

Period	Total number using centres	No. who later developed V.D.	No. who failed to take precautions	Total V.D.
1st six months. (Protargol instillations or Pot. Permang. irrigations)	5,274	202	118	320
2nd six months. (Simple Method)	5,447	183	102	285

During the first six months, a few centres were still using potassium permanganate, but the total who used protargol was 4,622. Of these 114 (2·4 per cent) later developed gonorrhœa, whereas during the second six months 5,447 carried out the simplified treatment and of these 133 (2·4 per cent) afterwards developed gonorrhœa.

The number who failed to take precautions was 118, whilst protargol instillations and potassium permanganate irrigations were in use, as against 102 when the simplified method was employed.

The total number of cases of venereal disease for the period September 1, 1939, to February 29, 1940, during which the protargol instillations or irrigations with potassium permanganate were in use, was 320, as against 285 during the period March 1, 1940, to August 31, 1940, and 305 during the corresponding period in 1939. This is summarized in the following table:

Period	Type of Centre	Number using Centres	Those who later developed		Those who failed to take precautions	Total V.D.
			1, Gonorrhœa	2, Other V.D.		
1/9/39	Protargol	4,622	114 (2·4%)	64	—	—
to	Pot. permang.	652	13	11	—	—
29/2/40	Total for six months	5,274	127	75	118	320
1/3/40	Simple method	5,447	133 (2·4%)	50	102	285
to						
31/8/40						

SUMMARY.

The results of these three methods of prophylaxis are compared in the following table:

Type of Centre	Number using Centres	Number who later developed V.D.	Percentage failures
Pot. Permang.	1,288	160	12.42%
Protargol	4,622	178	3.85%
Simple Method	5,447	183	3.35%

CONCLUSIONS.

(1) As a result of simplifying the treatment in P.A. Centres there has been an increase in the number attending for prophylactic treatment.

(2) The omission of protargol instillations and of potassium permanganate irrigations from the preventive treatment has not resulted in any increase in the number of cases of gonorrhœa, thus suggesting that the introduction of antiseptics into the urethra has little or no effect on the prevention of gonorrhœa.

(3) There were thirty-five fewer cases of venereal disease during the six months in which the simplified method has been in force than occurred during the previous six months, and there were twenty fewer cases than in the corresponding period in 1939.

(4) The treatment is simple and painless, requiring no special apparatus or specially trained attendant.

In conclusion the writer would like to thank Colonel J. T. Simson, A.D.M.S., China Command and Lieutenant-Colonel C. Armstrong, *M.B.E.*, R.A.M.C., for their helpful criticism and permission to forward these notes for publication.

APPENDIX.

INSTRUCTIONS FOR P.A.C. ORDERLIES.

(1) Examine the soldier to make sure that he is not already suffering from venereal disease. If he is suffering from venereal disease, give no treatment and see that he reports sick.

(2) See that the soldier washes his penis and parts around with soap and water, paying particular attention to the knob, ring, bridle string and scrotum.

(3) The orderly should then soak three pieces of wool in the lotion (1 : 10,000 solution of hydrarg. perchloride).

With one piece, thoroughly swab the penis and parts around, including the scrotum and penis, with the second piece, the knob and bridle string and with the third piece, the mouth of the pipe.

(4) GET THE SOLDIER TO URINATE IN GUSHES.

(5) Repeat No. 3 above.

(6) Rub the ointment well in, especially the knob, around the ring and bridle string. Rub well in for five minutes.

(7) The hands of both the soldier and the orderly should then be thoroughly washed.

(8) Issue the chit.

PERSONAL EXPERIENCES IN FRANCE.

BY LIEUTENANT D. I. MCCALLUM.

Royal Army Medical Corps.

ON May 20, 1940, the 13th Casualty Clearing Station, then near Domart, about 15 miles northwest of Amiens, was evacuated, making towards St. Pol. About forty of our number, who could not be accommodated in motor transport, went on foot, and by the time we reached Doullens we found ourselves cut off by German motorized units. Colonel Morris decided that our only chance of escape was to divide up into three parties, each commanded by one of the three officers. I, being the junior officer, was sent off first with two Serjeants, two Corporals and eight men. My instructions were to contact Allied Forces if possible.

As our road to St. Pol had been cut off by the German motorized units, our one chance of escape seemed to be westwards. We made across country for some two miles and then came on the Doullens-Auxi le Château road. There we stopped a French civilian who was doing his best to cycle past without recognizing us. He was very agitated and attempted to make off hurriedly when we inquired whether there were any Germans in the vicinity. When pressed further, he merely indicated with his thumb that he had seen them along the road. There was evidently no time to lose so we made a dash across the main road, to be greeted with a hail of machine-gun bullets all of which fortunately passed over our heads. (At this time we were wearing our Red Cross brassards.) The tank which had spotted us was only about 200 yards away and covered the bridge over the River Authie, so we had no alternative but to swim.

Of our thirteen, six were non-swimmers, so we contrived to make a hand bridge with straps from our equipment. Serjeant Wilson, being the strongest swimmer, went first and was followed quickly by four non-swimmers. While the fifth was crossing, one of the buckles became undone, and the soldier found himself in difficulties. He was, however, taken to safety by the timely action of Sapper White. The rest crossed without much trouble and, in our wet clothes, we proceeded to a nearby farm where we had a meagre meal consisting of raw eggs.

It was decided to travel by night and sleep by day. At ten-thirty that night we started off on the first stretch, knowing we were surrounded by enemy motorized units whose engines we could hear throbbing in the darkness. By way of completion to this day's adventures, we were chased by quite the most vicious bull I had seen for many a long day.

At about two o'clock on the following morning, two of the men had to fall out through sheer fatigue. We took them to an evacuated farm where we made them as comfortable as possible and left them with food enough for some days.

The rest of us pushed on and during the next four or five nights made our way through woods and the Forest of Crecy, sleeping by day and never daring to talk above a whisper. It was here we came very near to being found by a German patrol which passed about twenty yards from our hiding place.

On our sixth night out we had the unpleasant experience of running into marshland which had not been shown on the one map we boasted between us. After wading in mud up to our thighs for two and a half hours we hit on a pathway which led to a railway. There we put up for the night in a small hut.

The next day we were given shelter—and incidentally a compass—by a kindly French official who assured us that Mussolini had been killed, that the Turks and Russians had entered the war and that the British were going to force their way across the Somme and would soon be in that area. For a week we lived cooped up in a hut with plenty to eat but surrounded by the Germans.

At midnight on June 3 word was brought to us by another friend that the Germans would be occupying our billet within half an hour. We set off at once and found large concentrations of German troops on all sides. Indeed, we almost ran into German guards at le Crottoy.

The following day we got in touch with a Belgian family who proved most helpful. They pointed out to us that our plan for rowing across the mouth of the Somme was quite impracticable owing to the rapid change of the tides, and that our safest way was to swim. In preparation for the crossing we equipped ourselves with the inner tubes of several motor tyres to support the non-swimmers. We also made a rope to be carried by the swimmers and held by the non-swimmers. Two things were essential for the crossing. The tide had to be as far out as possible and, in view of the fact that the Germans had machine-gun posts on both sides, it had to be a dark night as there was a mile and a half of sand all within range of the machine guns. It was decided that, rather than wait for another week when conditions might have been better, the crossing should be attempted at once, although it meant facing an incoming tide.

There were now five swimmers and six non-swimmers. Late at night we raced across the sands, carrying our equipment in sacks and bending low. There was no moon, and no one spotted us. We were almost within sight of the other bank when, with the sound of the in-rushing tide in our ears, we came on the Somme River. The tide was certainly coming in very quickly. Our first misfortune was to discover that the soldier who had been entrusted with the rope had dropped it in the rush across the sands. Then two of the men, thinking they could make the crossing more easily at a different spot from the main party, went off by themselves. What happened to our two comrades we do not yet know. The main party—nine all told—got across, the Serjeant and the Sapper doing magnificent work in helping the non-swimmers. By the time we reached the other bank we had had to discard

all our clothes but our shirts and the current had carried us 200 yards upstream in a 300 yard crossing. For half an hour we waited on the other side for our lost comrades but they did not rejoin us.

For five or six hours we walked barefooted and almost naked. During that time we had to dive into the roadside on two occasions when our own bombers dropped flares and proceeded to bomb the bridge at St. Valery a mile or two distant. Then we came upon a hut that must have been occupied very recently by a Highland Regiment. We rigged ourselves out with jackets and great coats. Later that night, at a deserted farm, we found sufficient French civilian clothing for all nine, two of us setting rather a new fashion for hikers by resorting to "dancing pumps."

The Germans were in occupation here and the next night we had a very uncomfortable journey passing Cayeux. The clatter made by nine pairs of feet on this pebbly shore can well be imagined. To avoid detection we walked in shallow water where a new difficulty awaited us, for it seemed to us that the phosphorescent glow from our feet must have been seen for miles around.

The next few nights passed without any particular incident and by Wednesday, June 12, we had reached Mers adjoining le Treport. Serjeant Wilson and I, being the two who could speak some French, went out, as we had done on several occasions, to get provisions, leaving our comrades to enjoy a well-earned rest in an evacuated house. On returning, we were shocked to see a German sentry on guard at the door. One of our lads managed to signal from a window, waving to us to get back down the road. All seven had been captured. For seven to eight hours we two fodder hunters hid in a hen house and, at 10.30 at night, set out towards Eu, passed it about midnight and proceeded westwards. We were now making for the Seine. The Germans were to be seen everywhere but, as most of the houses here had been deserted, we had no difficulty in finding provisions on the farms.

About four o'clock on the morning of June 19, a week after losing our comrades, we reached the Seine where we lay on the bank within earshot of German sentries for eighteen hours. During that time Serjeant Wilson managed to blow up the inner tube of a motor tyre with a bicycle pump. The tube was fitted into a sack and an interlacing network of twigs worked into the sacking so that we had a fairly firm raft for carrying our clothes and what little food we had with us. We crept away from the sentry post for about half a mile and entered the water at 11.30 at night. It was almost a full moon and we were seen and fired at but not hit. The water was covered with a thick scum of crude oil from the refineries which had been fired by the Allies as the Germans were advancing. On emerging at the other side we hardly recognized each other. We were both like negroes.

That night we spent in a nearby barn. In the morning we learned from the farm people that the Germans were here also. Our plan now was to make for Jersey, for, having been house-doctor there some time before, I

knew something about the island. All this time we made our way by night, covering between twelve and fifteen miles at a stretch, entering a barn in the early hours of the morning, sleeping there till early afternoon, having a snack from the food that we carried and then about 7.30 in the evening making our way to the nearest farm and asking for some food. The kindness of these peasant folks is beyond description. During the ten weeks we spent in the Occupied Zone we were refused food on one occasion only.

Four nights after swimming the Seine we were making our way westwards near the town of Caen when at 2 a.m. a voice ahead of us snapped "Halt!" Immediately afterwards a figure staggered out of the ditch by the side of the road. I thought it was a drunk Frenchman at first but was soon disillusioned when I found myself, a minute later, facing a German corporal sentry complete with fixed bayonet. He ordered us to advance ten paces. To our right, at the side of the road, were drawn up half a dozen German lorries and several staff cars. From one of these emerged an Officer who talked for a short time to the Corporal, the only word I recognized being "Englische." He then turned his attention to us and, in French even worse than my own, very deliberately asked "Qui êtes-vous?" I explained that we were refugees returning to Caen. (At this time we were in civilian clothes and were complete with berets.) The officer then asked for our papers. I replied "Pas de papiers." "Pourquoi?" I elaborated that we had had to leave home so quickly that all our papers were left behind. It was difficult for him to understand why we should be travelling by night and all my arguments did not save us from being searched. Fortunately, all he found in our baskets was eatables from the last farm and a spare pair of shoes. Obviously puzzled, he shrugged his shoulders and barked "Allez." To my horror Serjeant Wilson, who had been silent up till now, politely asked in a pronounced English accent: "Voulez-vous un fromage?" to which the officer replied in no uncertain fashion.

On June 26 we made for the River Orne. All bridges across the river were closely guarded as was the Paris-Caen railway which runs parallel to the river at this part. At about 10.30 at night we cut our way through the thickets by the side of the railway, crawled over the rails on our stomachs, and so reached the river's edge. We were prepared to swim across but found it was possible to wade as the water came not higher than the level of our necks. From that point we continued to go cautiously by night having our shoes muffled with pieces of sacking. At last we reached the coast opposite Jersey and I was very glad that the end was in sight as I was suffering from acute muscular strain. Imagine our dismay when we heard that the island had been occupied three days earlier! To cap our misfortunes, the people in this particular district were under penalty of death if they should help the British. After a much-needed two days' rest we proceeded southwards, now making for the Pyrenees as our only method of escape from France.

The terms of the Armistice had not yet reached this part. Ten days later we were able to thank a Belgian refugee for the comforting news that part of France was still unoccupied. We now directed our steps towards Tours. On several occasions we narrowly escaped Nazi sentries and, as there was a curfew on all German-occupied territory, we could not bluff our way if challenged.

By Thursday, July 25, we were within twenty miles of Tours. There a kindly French artisan invited us to his house for a meal and, hearing that we intended to swim the Loire and the Cher in our bid for freedom, suggested a much better and safer way. This good friend not only offered to lend us each a bicycle but to conduct us personally through Tours, where the streets were full of German troops, and to deposit us and the machines at a farm twenty miles on the other side of the town. His plan worked perfectly. Not once in our journey were we questioned by German sentries. Incidentally the countryside here was the most beautiful that we had yet passed through. Touraine has well been described as the "Garden of France."

After taking our leave of our generous host we proceeded on foot in an easterly direction towards the zone "non-occupé," and by 4 o'clock next morning we were within ten miles of Free France. Here we slept in a deserted farm and about midday we set off again. Part of the time we played the role of peasants working in the fields, carrying forks to make our play-acting complete. Having ascertained from the peasants where exactly the frontier lay and where sentries were posted, we crossed to Free France near Loches about 5 o'clock on the evening of Saturday, July 27. At Chateauroux an official explained to us that we would be interned "somewhere in France" and, as he himself was not interested in interning us, he advised us to make for Montpellier, 300 miles away. We had very little money left but by hitch-hiking we arrived there on July 30. Inquiries here led us to believe that our greatest chance of escape lay in Marseilles where the Americans were in charge of British interests. We arrived in Marseilles within twenty-four hours, with about twenty francs between us, and were told that we would receive money only if we gave ourselves up to the French authorities and were interned. Consequently we found ourselves in Fort St. Jean the next day.

After one month, during which time I made three attempts to escape, I managed to get clear of French Authorities and so back to Britain and freedom.

Editorial.

U.S.A. ARMY MEDICAL REPORT (1940).

THE Report of the Surgeon-General of the United States Army for 1940 has recently come to hand and provides a good subject for an article as it deals with many augmentations and changes in the United States Army Medical Service resulting from the European War. Though produced in June, 1940, the Report publishes vital statistics for 1939 only, and so we shall have to wait until next year to take account of the interesting increases in strength which are certain to be brought into prominence in statistical tables and figures. There are, however, certain increases in 1939, and this year is notable for the first stationing of American continental troops in Puerto Rico and a consequent increase in the local diseases well known to attack the native troops there in previous years.

“The admission rate, all causes, for 1939 was 529 per 1,000 strength, and is the lowest on record for the Army.” The numbers for a thousand of strength for the different countries in which significant numbers of troops were stationed, are as follows : Panama, 693 ; Philippines, 668 ; United States, 544 ; Total Army, 539 ; and Hawaii, 389. The climate of Panama and of the Philippines accounts for the high rates there recorded while the very low figure for Hawaii reflects the almost ideal conditions prevailing in that island. The deaths, set out in the same form, from all causes, were : Philippine Islands, 4.04 ; United States, 3.06 ; Total Army, 2.79 ; Panama, 2.47 ; and Hawaii, 1.33. To show the marked effects of enlisting the services of many different races the tuberculosis admission rates may be taken as typical. They were, for the peoples specified, as follows :

Filipino Enlisted, Philippine Islands, 6.37 ; Puerto Rican Enlisted, 4.62 ; Coloured Enlisted, U.S., 3.46 ; White Enlisted, 2.38 ; Total Army, 1.80 ; White Enlisted, U.S., 1.80 ; White Enlisted, Panama, 1.55 ; All Officers, 1.00 ; White Enlisted, Hawaii, 0.64. It is interesting to find that the Filipinos get such a high incidence of the disease. Coloured troops, though still high, are tending to become relatively immune and to show a lower rate, while the White Enlisted of the United States and Panama show a considerable resistance to the infection and the Hawaiians are characterized by a remarkable freedom from tuberculous manifestations. It is satisfactory to find that there were no cases of paratyphoid fever and that only seven cases of typhoid were recorded, of whom two were still doubtful at the time of submitting the report. Gastric and abdominal illnesses seem to be much as with us if we may take rates for the professional army as a comparison. “Gastritis and acute enteritis” together accounted for 18.5 per mille, appendicitis for 11.0, colitis and other enteritis for 4.5 and

ulcer of duodenum for 1-6. It is possible that, with the calling to the colours of numerous persons from strictly civilian occupations, as at present in our Army, a good many may be found to be unable to tackle the Army ration owing to digestive troubles kept in check by the serving of special dishes in the home, but the relative freedom of the Standing Army from gastric trouble is worthy of note. The portion of the Report dealing with the early part of 1940 is of great interest though not yet indicating the increases now in progress. Under "Enlisted Personnel Subdivision," it is recorded that the authorized strength of the Medical Corps was increased from 8,643 on June 30, 1939, to 13,628 on June 30, 1940. "This increase was utilized in two ways: (1) To increase the number of enlisted men assigned to station and general hospitals to take care of the increased hospital patient load incident to an expanding Regular Army; and (2) to organize the Medical Department units and detachments for field service."

"Since December, 1939, the following Medical Department tactical units and detachments have been reorganized or newly organized:

"Medical regiments 2; 1 new. Medical battalions 6; all new. Provisional medical battalion 1; new. Medical squadron 1, reorganized and augmented; Medical troop 1; ditto. Ambulance company 1; reorganized. Veterinary company (Separate). Attached Medical, for the Infantry, Field Artillery and Engineer units in 6 Infantry Divisions."

Medical regiments, battalions, squadrons and troops! These seem to be new developments but, in reality, are not very different from the Field Ambulances and Casualty Clearing Stations familiar to us. They may prove to give that degree of elasticity which we are conscious of having lacked when our medical units were put to the severe test of a new kind of war; or they may, on the other hand, prove to be too fluid and require to be thought out in terms of Field Ambulance and C.C.S. equipment; nothing but a real test, including a retreat, can decide! But it is very encouraging to find the American Army Medical Service trying these new methods. We wish them every success.

Hospital Trains are evidently the subject of extensive plans and a unit has been designed in conjunction with the Pullman Co. for 500 patients. "Such hospital trains will be used . . . in the theatre of operations if suitable railway equipment is available." The size of this train is, of course, very convenient if it can be used, but we fear that there may be difficulties in finding sidings available when there is great congestion, as in active operations. There is much to be said for smaller trains and more of them.

Of the types of medical activity suitable to an Army in peacetime, the Army Medical Museum and the Library are outstanding features. The Museum is administered under the supervision of the Professional Service Division and is under the immediate direction of a Medical Officer who is the Curator. The Library is in a big building which, when we visited it in 1926, was adequate to its functions but has now reached saturation so that a new Library is about to be provided. The personnel consists of an officer,

the only commissioned officer on duty there, and 31 civilian employees, five of whom have the title of principal librarian, senior librarian, etc. There is an appropriation of \$25,000 a year for the purchase of medical books, periodicals, old, rare volumes and other accessories. It is doubtful if this sum will suffice for the future as it is strained to the utmost at present. The Surgeon-General appears to control the medical organization of the Flying Corps, the Veterinary Service and, like our Director-General, the Army Dental Service and the Nursing Service. On all these subjects it would be possible to write also but we confine ourselves to the strictly medical portion.

We offer our best congratulations to the Surgeon-General on a most interesting Report.



Clinical and other Notes.

MILD SEQUELÆ FOLLOWING ANTI-RABIC VACCINE ADMINISTRATION.

By MAJOR P. F. PALMER,
Royal Army Medical Corps.

A LADY who had been given the mildest course of anti-rabic vaccine, consisting of a daily injection of 2 c.c. for seven days, soon after completion of the treatment complained of pains over the hips, constipation and an inability to feel the act of defæcation when it occurred. Later she complained that even gently rubbing herself with a towel over her hips caused tingling pains.

That this was due to the injections was corroborated by a Warrant Officer who was undergoing a daily injection of 5 c.c. for fourteen days. He stated that he suffered from a somewhat similar condition. His bowels had always been extremely regular and he visited the bathroom on getting up each morning. On two or three occasions he visited the bathroom as usual, sat on the commode, and after a while gave it up as a bad job, thinking that he would try again later. To his surprise, on replacing the lid, he noticed that he had passed a stool. This occurred shortly after the beginning of treatment and before the course was completed. These mild effects correspond closely with the major sequelæ which always occur within thirty days, 88 per cent beginning within twenty days. The earliest symptoms noted have been within seven days of the commencement of treatment and the latter case began about the same time.

IMPROVEMENT IN THE STRUCTURE OF THE BUCKET LATRINE.

By O.C. A FIELD HYGIENE SECTION.

THE bucket latrine, which has been chosen in many Divisions as the most effective method of disposal of fæces, has been found to suffer from a few defects which are easily and cheaply remedied with the use of tools and material readily to hand under active service conditions.

The prime defect noted in many inspections of billets and camps was the lack of a self-closing lid. In the regulation superstructure of the latrine a wooden bar is fitted to prevent the lid opening beyond a right angle. This device causes the lid to fall under the influence of the force of gravity when the user vacates the seat. Unfortunately it also causes discomfort by

pressure upon the back during the act of defæcation and hence is often broken or removed by the soldier in an excess of unease.



FIG. 1.

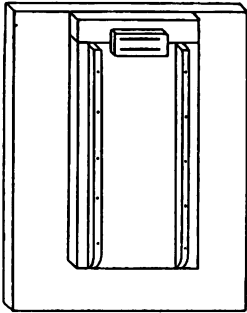


FIG. 2.

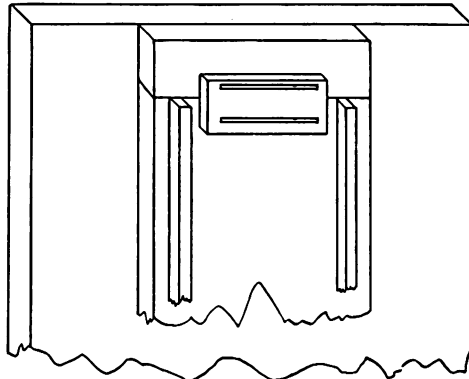


FIG. 3.

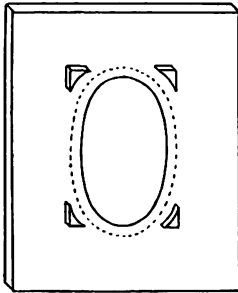


FIG. 5.

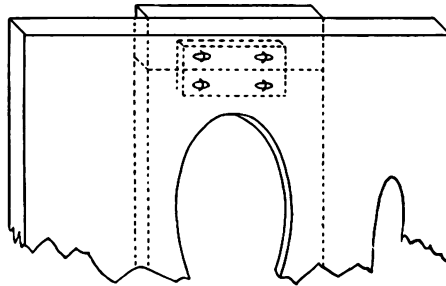


FIG. 4.

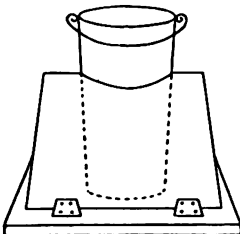


FIG. 6.

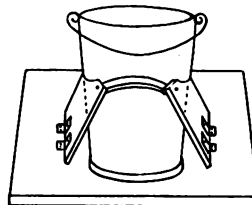


FIG. 7.

To overcome this difficulty the hinge described and shown diagrammatically (figs. 1, 2, 3 and 4) is installed by my Section. It is indestructible, permanent and comfortable in use.

The materials needed are: 2 pieces of thick wire 10 inches long

4 staples ; 1 used outer motor tyre (sufficient for 36 hinges). The tools required : 1 hammer ; 1 nail ; 1 penknife.

To make the hinge, cut out a strip from the rubber tyre 6×2 inches and cut a hole in each corner (fig. 1). Thread the wire through the holes in the strip and draw it tight, squaring it off with a few blows of the hammer. Bore corresponding holes in the latrine cover and seat (fig. 4), thread the wire through these and bend it over, finishing the attachment by a staple straddling each wire below (figs. 2 and 3). The rubber should be attached with the outer side upward to give full effect.

With this device the lid can be easily opened beyond a right angle, indeed to 180° , yet closes automatically by the natural elasticity of the hinges. The need for a wooden bar and its supports is eliminated, a very much lighter lid of three-ply wood can be used, the hinge can be fixed far back allowing a longer resting area for the buttocks, and a larger hole can be constructed. Finally the cost of the improvement is less than 1d. per hinge.

A second difficulty encountered is in deficiency of the bucket guides and platform. The guides below the seats have here been shaped to fit closely to the rim of the bucket (fig. 5). This prevents the seat sliding and the holes moving from the opening of the bucket thus giving rise to soiling of the ground and entrance of flies to the bucket contents.

These guides are readily shaped and attached with the aid of a saw, penknife, nails and hammer.

To prevent the bucket rocking on its platform the following apparatus is designed (figs. 6 and 7). It consists in a wooden square with hinged wooden attachments the free edges of which are cut to fit the bucket. These free edges are joined together by means of pieces of rubber tyre (fig. 7). Thus if the bucket tilts in one direction the opposite wooden support presses upon it and restores it to the vertical. This structure does not prevent the easy removal of the bucket for cleansing.

The material needed is wood, a used tyre, staples, and wire, and the tools, a spokeshave, nail and hammer.

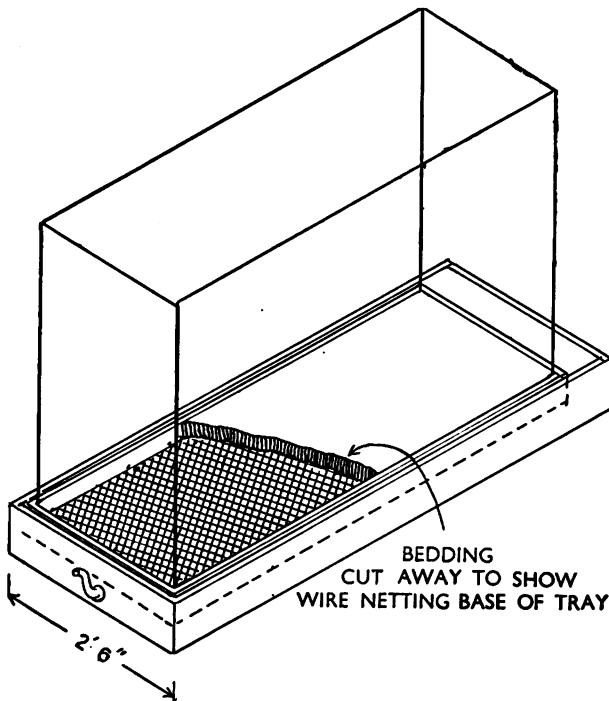
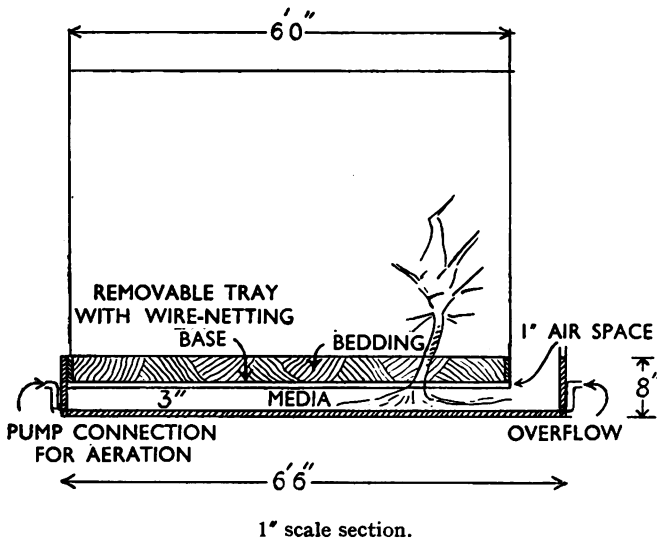
HYDROPONICS AND AGGREGATE CULTURE.

BY MAJOR R. S. DE C. BENNETT,

Royal Army Medical Corps.

THE above subject has interested me for a considerable time and now that the war is turning towards the East, I feel that if hydroponics and aggregate culture were scientifically developed it would have a very definite bearing on the general health of troops.

Hydroponics is a type of culture that has been done by natives in a crude way for centuries and has only recently been placed on a scientific basis by Professor Gerichi.



Isometric sketch.

Hydroponics consists of cultivating plants in nutrient solutions or, put more simply, water plus essential mineral salts for plant life.

The mineral elements essential to plant life besides water and carbon are nitrogen, calcium, magnesium, potassium, phosphorous, sulphur plus trace elements such as manganese, iron, boron and zinc. These minerals are normally in soil ; in hydroponics and aggregate culture these minerals are added to the water to make a growing solution or medium. The ideal regions for outdoor hydroponics are tropical or subtropical desert regions where there is bright light, heat, the minimum of plant pests and an average nutrient temperature of 70° to 75°.

Most people know the very elementary form of growing mustard and cress on wet flannel or a hyacinth bulb in a bulb glass. The more elaborate form of culture consists of a watertight non-corrosive tank made of glazed earthenware, wood, steel, iron, or cement suitably treated. This is encased in outer walls, the space between being filled with non-conducting material ; the tank is then half-filled with the mineral solution ; an outlet drain is provided at the bottom of each tank and used as an overflow or aerating pipe as necessary ; a wire mesh tray is fitted on the top of the tank containing the bedding material, excelsior or wood wool with a surface covering of peat moss. This supports the plant and excludes light from the nutrient solution, eliminating the growth of algæ.

This is only a rough description of the common variety of tank and one of the most suitable on account of its cheapness and efficiency, so that an idea may be gained as to the type of container used. On a large scale commercial installation these tanks are connected together by pipes, etc.

In the diagram it will be noticed that the tray has four uprights (which may vary in length) joined together and used either for lifting out the tray and if necessary examining the plant's roots or attaching cross wire supports for tall growing plants. The amount of fluid medium required for a depth of 4 inches would be approximately 34 gallons. The air space under the tray is generally about one inch or so according to the type of plant root growth ; the air space at the end allows for aeration and gives room for checking the depth of nutrient medium after evaporation, etc. Aeration is of vital importance and may be simply done by an air pump or cycle pump attached to the air pipe which is aerated for a minute or so once or twice a day, at the same time thoroughly mixing the medium the salts of which tend to sink to different levels.

Another point of great importance is to keep the solution mildly acid and the pH (hydrogen-ion-concentration) should be tested weekly. This should be 4.5 to 6.0, i.e. the alkacid paper should become orange yellow in colour when dipped in the medium. If the medium at the end of a fortnight or so shows an alkaline reaction, sufficient sulphuric acid solution, one ounce to the gallon of water should be added until the orange yellow reaction is obtained.

There are about thirty nutrient formulas in use, according to climatic

conditions ; commercial grade salts may be obtained from any good local artificial fertilizer agent. One of the favourite formulas is that of Shive and Robbins of the New Jersey Agricultural Experimental Station :

Monopotassium phosphate	gr. 109
Calcium nitrate	gr. 370
Magnesium sulphate.. .. .	gr. 200
Ammonium sulphate.. .. .	gr. 32
Water to	gallons 5

To this is added as mentioned before two stock solutions, A and B.

A is composed of 49 grams each of boric acid, manganese sulphate and zinc sulphate, dissolved in 64 ounces of water to which is added gr. 10 of copper sulphate.

Two teaspoonfuls of this solution are used to 5 gallons of nutrient medium.

B is simply iron ammonium citrate 12 grams dissolved in 16 ounces of water.

Four teaspoonfuls to each gallon of nutrient medium are used.

It is necessary that all stock solutions should be kept in the dark and must be prepared and added to the water in the tank separately in order to prevent precipitation of sulphates and calcium salts.

The following formula would probably be more useful in Egypt or Aden owing to the amount of nitrogen used by plants in relation to the brighter sunlight :

Double superphosphates	gr. 43
Magnesium sulphate.. .. .	gr. 44
Potassium nitrate	gr. 296
Ammonium sulphate	gr. 192
Water to	gallons 5

To this of course trace element solutions A and B, as mentioned before, must be added but with an increase to 14 grams of iron ammonium citrate. The above formula is one of many recommended by Messrs. Withrow and Biebel of the Perdue University Experimental Station, Indiana.

Aggregate culture is perhaps simpler as mineral aggregate, viz. sand, gravel or cinder, is used in place of soil and the principle more easily grasped. The process is constantly to flush the mineral aggregate with nutrient solution in combination with seepage, etc.

It is difficult to give an unbiased opinion on the merits of the two systems but one or both could be tried.

There have been some remarkable crops grown under soilless culture up to twenty times the normal. Of course these are exceptional and under ideal conditions in California. There is no doubt that this new method is going to play a very important part in the future in arid zones. As an example it is at present being made use of in Wake Island, a Trans-Pacific air-liner station where there is not a vestige of vegetation. An experimental plant of 120 square feet of tank was at first used giving a weekly production of 33 pounds of tomatoes, 20 pounds of string beans, 15 pounds of vegetable marrow, 20 head of lettuce and 44 pounds of sweet corn. The plant has

now been increased tenfold and the air-liners are delivering vegetables to other rocky islands on their route.

The chief points in favour of developing this culture are its cheapness, rapidity of crop growth, greater yield (about eightfold), choice of location, small area of ground used and all the year round supply of vegetables which, from a medical point, cannot be stressed too much on health grounds.

I do not in any way wish to give the impression that hydroponics and aggregate culture is the panacea of agriculture but there is no doubt in my own mind that it is going to play a very important part in the future development of arid zones all over the world.

Experimental work is being carried out at Imperial Chemical Industries Research Station, Zealotts Hill, Bracknell, Herts, and also by Messrs. Suttons, and Reading University.

Literature on this subject: "Soilless Growth of Plants," by Messrs. Ellis and Swaney. This authoritative work is obtainable at any bookseller or Messrs. Chapman and Hall. "Plant Chemiculture," by Messrs. Dawson & Doran, 4615 W. Washington B.Vd. Los Angeles, Cal., U.S.A. "Hydroponics as viewed by California," by Hutchinson, C.B. (1938). "Market Growers Journal," Vol. lxii. "Hydroponics," a magazine devoted to soilless culture, published by The Hydroponic Publishing Company, 2211 Woodward Avenue, Detroit, Michigan, U.S.A.

My whole point in drawing attention to this little known type of agriculture is that a start should be made in the Near East. I would suggest a trial at hospitals in Aden and Egypt, by professional nurserymen, of whom there must be many in the Corps who could adapt themselves to this new science.

NOCTURNAL ENURESIS.

By MAJOR R. J. ROSIE,
Royal Army Medical Corps.

ONE of the most annoying of therapeutic problems with which the medical officer has to deal is that of nocturnal enuresis. This is not uncommon among young soldiers and it is thought that a short account of the disorder and its treatment by suggestion may be of some interest. Enuresis is very common in childhood. Addis (1936) reported that one out of almost every five children brought to the Child Guidance Clinics in London for whatever reason suffered from enuresis. Most of these cases cease about puberty but a few continue into adult life.

In the Army the unfortunate sufferer is too often regarded with suspicion by his unit officers and by the hospital staff. It is occasionally thought that he is himself in some way responsible for his plight and that what he really requires is a good scolding and proper training. Punishment for an act which he cannot resist and of which he is not even aware leads to a

sense of injustice. Soldier sufferers contain a high proportion of those who have enlisted in haste and repented at leisure and there are a few only too willing to use this disability as a means to obtaining their discharge from the Service. The majority, however, are anxious to accept treatment and in some cases parents have encouraged enlistment in the hope that Army life and discipline would remove the distressing symptom. When, as often happens, it fails to do so the unfortunate victim must bear the jeers of his comrades. His life becomes miserable and he is anxious to seek escape from the Army to the security of his own home.

Ancient home remedies still survive. There exists in some quarters a strange belief that the eating of the body of a cooked mouse will cure the condition. A common remedy is a bobbin fixed to the middle of the patient's back at night.

It is usually considered that a great variety of causes can produce enuresis i.e. phimosis, adenoids, hyperacidity of the urine, polyuria, unduly sensitive bladder, poor parental training, etc. The varieties of treatment in use are therefore also numerous and, if these fail, the disappointment aroused makes subsequent attempts at treatment more difficult. Disseminated sclerosis, spina bifida, locomotor ataxia, general paralysis of the insane and other organic diseases of the nervous system can cause involuntary dribbling of urine. Epilepsy is also responsible for a certain number of cases and bed wetting may be an early symptom of schizophrenia. These should, however, be regarded as cases of incontinence and not of nocturnal enuresis. This term should be limited to those cases which are of psychological origin. There is no doubt that emotional disturbances can affect bladder control. In situations of stress and strain such as occur in the case of a student awaiting an oral examination voluntary control over the sphincter may be diminished or lost. In most cases of nocturnal enuresis there is no loss of sphincter control and no frequency of micturition during the daytime. As suggestion in the hypnotic state can, in many cases, remove the symptom a purely organic basis for the disorder can in these cases be excluded. Although suggestion is most effective upon the mind in the hypnotic state it is also inherent in every variety of treatment and the masked suggestion behind the belladonna mixture or operation of circumcision may explain the favourable results that may follow such lines of treatment.

Enuresis occurs in mental deficiency although not as frequently as might be expected. Soldier sufferers are often of at least average intelligence and are made miserable and unhappy by their symptom. It occurs among all classes and after every variety of training.

It has been suggested that nocturnal enuresis is an outlet for sex tension and a substitute for masturbation and that the tension relief of micturition is an attempt to enjoy the pleasures of masturbation without the guilt attached thereto. In most soldier sufferers, however, masturbation and incontinence co-exist in the same case.

Certain cases may be caused by an unconscious desire to escape from the difficulties of life and return to the sheltered existence of the baby. One wets the bed like a baby because one wishes to have the privilege of being a baby again.

During infancy the passage of the warm stream produces pleasurable sensations in the urethral mucosa. The infant obtains pleasure from the act and urinates when and where it wishes. The act is a creative activity, in that the child is producing something from its own body without outside assistance and the ability to forcibly expel the substance gives it a sense of power. These pleasurable activities are soon subject to adult regulation and control. Rewards are given for good urethral behaviour, and the child has to submit to adult regulations by day. During sleep inhibitions are relaxed and the child can continue to indulge these earlier pleasurable activities and at the same time can give expression to its unconscious feelings of hostility for and revenge on the parent who withheld the form of erotic gratification desired by the child.

One or other of these faulty emotional attitudes may be associated with the development of the symptom in children but its persistence in adult life may be caused by associations which produce a conditioned reflex.

During the past year six adult cases of nocturnal enuresis have been treated. Four were of a highly strung nervous type and the remainder phlegmatic and non-emotional. All showed other signs of psychological disturbance. One case suffered from occasional hysterical fits. Long standing enuresis is, however, likely to be complicated with symptoms of an anxiety state which may be induced by the unskilful and unsympathetic handling of the patient who is rendered miserable and hopeless by a succession of failures of treatment. Two of the six cases treated were severe. The frequent recurrence of the symptom since childhood, both in civil and in military life, had made their lives one of misery. One unfortunate, without parents or home, had in civil life been turned away from many lodgings owing to his failing. The feeling of hopelessness present in this case was tragic. The remaining four cases suffered from occasional incontinence but in no case was the free interval longer than three months.

Five cases were treated by suggestion while in the hypnotic state and the sixth case by suggestion in the waking state. All responded to treatment. At least six months without a wet bed was taken as the criterion for a cure of the symptom but no attempt was made to discover the shortest time in which it was possible to obtain a cure by this means. The patient must first be encouraged to tell his story in his own way and will benefit from this opportunity to relieve his mind to a sympathetic listener. Some may appear to be callous about their symptom but this aloofness is only assumed. When the patient realizes that his complaint is understood and confidence in the ability of the physician to help him out of his misery is aroused, much has been attained.

Light hypnosis only is required and the mere induction of this may by

itself do good and be followed by an increased feeling of confidence. The hypnotic state is induced because, owing to the peculiar attitude of the subject to the physician, ideas which in the waking state would pass unheeded are now received and acted on without criticism. Suggestions made in hypnosis can influence bodily processes which normally are controlled by the involuntary nervous system and can increase or delay their activity. Suggestions can increase or decrease salivary and gastric secretions, bowel peristalsis, flow of bile, etc. The suggestions must be made confidently and the whole atmosphere must be one of cure.

In the treatment of psychoneurotic disorder as in that of other branches of medicine one should consider the condition as a whole and not in terms of the symptom alone. The analytic approach or treatment of choice may for various reasons not be practicable, and the use of simpler methods which can remove the symptom may be justified. Although this treatment is mainly symptomatic and the basal causes of the condition may not have been attacked the symptom is removed and the patient's life is rendered more bearable. The subsequent and continued gratitude of the patient is some measure of the success of this treatment in nocturnal enuresis. The adult sufferer from nocturnal enuresis is a most unhappy person and this treatment is recorded to draw attention to a simple and effective remedy which seems to be little practised at the present time.

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Current Literature.

BARLING, S. Amputation of the Extremities in Cases of War Wounds.
Post-Graduate Med. J. 1940, May, v. 16, 162-7.

The author refers to the considerable modification that has taken place in the attitude of surgeons towards the problems of amputation stumps and the fitting of artificial limbs as the result of experience gained in the treatment of large numbers of cases after the last war. These results of research and investigation carried out under the Ministry of Pensions at Roehampton and other limb-fitting centres are now available for the guidance of surgeons.

The improvement and standardization in design of light metal limbs has to some extent tended to standardize the type of operation which precedes the fitting of the limb, and a very much more successful final result is probable if the surgeon knows something of the limb-fitters' problems and plans his operation so as to produce a stump which is in every way suitable for what is, after all, the only matter of real importance, the subsequent fitting of the prosthesis.

Though artificial limbs have to some extent become standardized, it must be clearly understood that each patient to whom one is to be fitted presents an individual problem.

The psychology of the patient, his capacity for adaptation, his occupation, no less than the length of the stump, its shape and variation in the site of scars and its capacity to stand up to daily wear and tear, are all individual problems.

The Stump : The primary function of the stump is to act as a lever, and the question of length is therefore all-important. If it is too short the area of contact with the limb socket is insufficient for the leverage required to make the proximal joint effective. If it is too long the blood supply of the distal portion is imperilled, and the stump will not stand up to the wear and tear of daily use without development of pain and ulceration, especially in the lower limb where the movements of flexion and extension during walking cause a piston-like action of thrust and withdrawal of the stump in the limb socket.

For the same reason scars are a source of weakness, and the amputation scar should be planned so that it cannot adhere to bone or be subject to direct pressure. A sufficient margin of healthy tissue should be allowed at the site of injury or disease, or the lowered resistance of damaged tissues may lead to pain and ulceration after some years of use.

During the period of healing, and for the first month, the stump should be left as much as possible at rest, but care should be taken that it does not become flexed and that joints do not become stiff. These complications can be prevented by attention to posture and by occasional active movements of the joints. After the first month regular exercises should be carried out to improve the condition of muscles and joints. Shrinkage of the parts sets in and should be assisted by firm bandaging of the stump from the tip upwards with a flannel bandage, as until this process is stabilized the stump is not fit for its final fitting with a limb.

Sometime before this, however—in two or three months in favourable cases—a temporary limb of simple pylon type with plaster socket should be fitted to accustom the patient to some of the problems arising from the new position, and to assist in hardening and shrinking the stump. [The practice of fitting a temporary limb for its effect on the stump, which is often the reverse of what is desired, is condemned in a Ministry of Health Circular, E.M.S./Gen./296, especially in regard to its adoption by unskilled persons. If a pylon must be used it should be made and fitted only by the limb-maker who is subsequently to make the permanent artificial limb.]

The ideal stump should taper somewhat towards its distal end, should be well covered but without bulky masses of tissue, and should have a normal range of movement at its proximal joint. It should not be unduly sensitive to pressure.

Indications for Amputation : These may be conveniently considered under the following headings :—

- (A) Primary amputation.
- (B) Amputation during the stage of progressive sepsis.
- (C) Secondary amputation.

(A) *Primary Amputation.*—In some cases the indications for immediate amputation are clear ; in others the decision will be taken as the result of findings when the wound is explored under an anæsthetic. Great comminution of bones and damage to joints, failure of circulation in the distal parts of the limb and evidence of serious nerve injury may indicate the necessity of primary amputation, and to these may be added the presence of serious major injuries elsewhere, the age of the patient and the absence of satisfactory conditions for immediate after-treatment of the wounded limb.

It must be borne in mind by surgeons accustomed to dealing with civilian injuries caused by industrial accidents and motor smashes that high velocity projectiles cause wide-spread damage in the depths of the wound, often at a considerable distance from the apparent track of the projectile, and that vessels and nerves may be torn, and extensive hæmorrhage may take place along intermuscular planes, thus opening up channels for the spread of sepsis. The surgeon may safely be more conservative in wounds of the upper extremity since the risk to life from sepsis is smaller and the capacity of the limb to survive severe vascular injury greater than in the case of the lower limb. Any portion of a finger or thumb should be preserved if possible, as a hand with these stumps is generally more useful than any artificial appliance.

Two points in the anatomy of the lower limb are worth considering in deciding for or against conservative treatment. The big muscle masses in the thigh, when injured, form a favourable nidus for growth of organisms, especially anærobcs, possibly from the favourable growth pabulum afforded by the released muscle sugars ; and the vascular supply of these long muscle bellies is easily damaged, predisposing them to the transmission of sepsis. The second point is the danger to the vascular supply of the leg and foot resulting from wounds in the popliteal region.

(B) *Amputation During the Early Period of Sepsis.*—These are cases seen first a few days after wounding, with already established sepsis, and cases in which conservative treatment has failed. The patients are sick men and the decision to amputate may have to be taken promptly in order to save life. They include (1) cases with rapidly spreading sepsis often with gas-forming anærobcs ; (2) cases which have never recovered from the initial shock but remain lethargic with low blood pressure and slowly ingravescent sepsis in the wound ; (3) cases in which circulation in the distal part of the limb fails, either frank gangrene appears or low vitality opposes no barrier to infection.

(C) *Secondary Amputation.*—Some of the indications in this group are the occurrence of acute arthritis in a large joint, the presence of widespread osteomyelitis and pyæmia, and the gradual failure of the patient with wide-spread sepsis. The recognition that the limb in such cases will ultimately

have less functional value than an artificial limb, and that ablation will save many months of possibly vain suffering, may turn the scale in favour of amputation, and long standing cases of limb injury should be reviewed from time to time with this in mind.

The Operation.—Primary amputation often has to be carried out in the shocked patient and two or three hours spent in resuscitation, which should include blood transfusion in the exsanguinated patient, are desirable. The presence of the damaged limb, however, is itself a cause of shock, and if the systolic blood-pressure is 100 mm. Hg or over, amputation should be carried out with little delay.

A tourniquet should be used for the peripheral amputations. In amputations at or near the hip joint the femoral vessels should be ligated through a vertical incision afterwards prolonged into that of the amputation. Flaps should be of approximately equal length, as this ensures a better blood supply to each; they should be situated so that the scar will be free from pressure or adhesion to bone.

In the presence of sepsis it is often wise to sacrifice an inch or two of length to get healthier tissue for the flaps. Guillotine amputations are apt to be unsatisfactory and cause prolonged and painful convalescence. If sepsis is unavoidable the flaps should be lightly sutured over paraffin gauze, and in any case drainage for forty-eight hours is advisable. The main nerve trunks should be drawn down slightly and divided with the knife without crushing or ligature, except in the case of a large trunk like the sciatic which contains a definite artery and may be lightly ligatured.

If long standing sepsis has preceded amputation, a longer period of post-operative rest of the stump should be enforced.

Amputations Above the Knee: The ideal stump should have a length of 10 inches from the top of the great trochanter, or of 12 inches in a tall patient. The total length of the flaps should be one and a half times the diameter of the limb at the point of section; they should be of anterior and posterior type, and of approximately equal length. A circular amputation is satisfactory if preferred, the scar being transverse when sutured, and retracting slightly posteriorly. Such a stump is fitted to a socket with an ischial bearing and permits the fitting of a most efficient prosthesis.

If the stump has perforce to be shorter than 10 inches every inch of bone that can be conserved is of value, as even a length of 6 inches only will at times permit of a stump controlled limb. If the stump is shorter than 6 inches, a heavier and less efficient limb is necessary and the stump no longer acts as an efficient lever. After amputations through the hip joint the fitting of a limb is difficult, as the bucket cannot be efficiently fitted close to the side of the pelvis, owing to the concavity left by removal of the femoral head. If possible, therefore, the head and as much as possible of the neck and trochanters should be left when amputating through the hip. If it is impossible to leave as much as 6 inches of shaft, the bone section is best made at the level of the lesser trochanter.

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Below Knee Amputation: Six inches of tibia are desirable, and amputation at this level constitutes the modern site of election. A 4-inch stump is still useful, and even one of 2 inches or less may at times be utilized by the limb-maker as an efficient lever. Antero-posterior flaps, or a circular amputation cut so as to allow a slightly longer anterior than posterior flap, are best. The fibula should be divided 1 inch above the level of the tibial section. If the tibial tuberosities are free of scars, the limb bearing is taken here. Failing this, the bearing must be ischial, but this gives less efficient control. If the knee is ankylosed, in whatever position, it is probably best not to give a stump longer than 4 inches.

Syme's Amputation: The Syme stump has the disadvantage, inherent in all long stumps, of poor peripheral circulation, and in most pensioners after the last war reamputation was necessary, as these stumps did not stand up to wear and tear. In many civilian cases however, especially in children, Syme stumps have given long years of service, and the lessened mutilation of the longer stump undoubtedly makes an appeal.

Max Page [*Brit. Med. J.*, 1939, ii, 77] has suggested a modification of the classical operation in which the bones are divided 1 inch above the ankle-joint, and the heel flap fitted snugly over the bone ends, giving a stump which wears better and is easier to fit with an artificial limb.

Amputations of the Upper Limb: The relative inefficiency of prostheses for the upper limb warrants a strong bias in favour of preservation of any portion of fingers or thumb which can possibly function. When the hand has gone, however, the most suitable stump from the limb-fitter's point of view should be provided. As in the lower limb, amputations through joints should be avoided. The scar should be sited to lie transversely across the bone ends where, if primary union occurs, it may move freely over the adjacent bone. The early fitting of a limb gives the patient a more hopeful attitude and encourages the nutrition and general function of the stump.

Amputation Below the Elbow: Amputation $2\frac{1}{2}$ inches above the ulnar styloid process gives the most useful stump, and any length of bone up to within 4 or even 3 inches below the internal humeral condyle is useful. If the length of bone would be shorter than this the amputation had better be above the elbow joint.

Amputation Above the Elbow: The ideal level is 3 inches above the elbow joint, but any bone that can be left up to 6 or even 5 inches, measured from the tip of the acromion process, is useful. Above this the stump is fitted as for a shoulder amputation and loses its value as a lever.

Amputation At or About the Shoulder: In these amputations it is useful to preserve a portion of the upper end of the humerus since, though useless as a lever, it preserves the contour of the shoulder and forms an anchorage for the fitting of the shoulder cap of the artificial limb. The scar should lie vertically below the acromion, out of the way of pressure. W. B. FOLEY.

Reprinted from "Bulletin of War Medicine," November, 1940.

Competence of Venous Valves. Annotation, *Lancet*, September 21, 1940.

The tests for competence of the valves of the great saphenous vein have been simplified by McCallig and Hyerdale. They point out that all the surgeon wants to know is whether the valves in the three systems of veins—superficial, deep, and intercommunicating—are competent or not. To demonstrate incompetence in the great saphenous vein they examine the patient standing. The fingers of one hand are placed over the saphenous opening, the fingers of the other hand percuss a dilated segment of the vein below. If an impulse can be detected by the upper fingers, incompetent valves and a dilated saphenous vein are strongly suspected. Proof is provided by reversing the procedure; a wave passing down the vein can only mean incompetent valves. With competent valves local injection of the varices stands a good chance of success. Tying the main vein is needed as a preliminary to injection where the valves are incompetent.

In order to test for the competence of the inter-communicating veins, the patient lies down and his leg is elevated to allow the blood to drain away from the varicose veins. A tourniquet is placed high on the thigh and the patient then stands up. If the varicosities fill up rapidly, within thirty seconds, it is assumed that there has been an overflow from the deep to the superficial veins. In other words the valves of the communicating veins are incompetent. This test has not much significance, because incompetence of the communicating vein is always associated with incompetence of the great saphenous veins and efficient sclerosis of the main vein will, in most cases, counteract the effect of the back-flow through the communicating veins. In a few cases failure to occlude a localized segment may be explained by this back-flow, and carefully localized injection should be tried and will probably prove successful. The main contra-indication to sclerosing therapy is occlusion of the deep venous system, for then the saphenous dilatation is compensatory. The patency of the deep veins is tested by occluding the superficial venous circulation by applying a gum-rubber bandage from the instep to just below the knee, or as high up the thigh as required. If the limb is depending on the superficial venous circulation the constriction of the bandage will cause severe pain when the patient tries to walk, and he will ask to have the bandage removed. In such a case sclerosis of the saphenous system must not be carried out.

MINISTRY OF HEALTH. **Memorandum on the Production of Artificial Immunity Against Diphtheria. (Revised Edition.)** Memo. 170/Med. 7 pp. 1940. London: H.M.S.O. [1d.]

LANCET. 1940, February 10, 273-4. **Diphtheria not prevented.**

In Part I of the Memorandum are set forth certain general considerations regarding pathology, epidemiology, transmission, and means of prevention, including those generally classified as administrative and those falling under the heading of artificial immunization. It is emphasized that diphtheria



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is essentially a disease of children under 15 years and is the most common cause of death in children of school age, and that the advantages of immunization should be brought to the notice of all parents and guardians of children of over one year of age. In Part II the basis of acquired immunity is explained, the rôle of spontaneous immunization in bringing it about, how it may be measured by the Schick test, and how it may be stimulated artificially. In Part III the fact is stressed that though commonest in school life diphtheria shows its highest mortality in pre-school years. Therefore artificial immunization should form an integral part of the work of child welfare centres. The time taken to establish active immunity is mentioned and its duration is stated to be for years and perhaps for life. Since exceptions occur it is recommended that children immunized in infancy should be given a further dose of prophylactic on attaining school age. In Part IV practical recommendations, particularly with regard to the choice of prophylactics, are made. For children two doses of A.P.T. are recommended, one-shot immunization by inference not being recommended, and it is stated that in ordinary routine probably A.P.T. will be the prophylactic preferred. With regard to F.T. the curious remark is made that "where protection is urgently required and the necessary tests can be carried out, F.T. is the prophylactic of choice." When demands on the medical officer's time must be reduced to a minimum and reactions must be avoided even at the cost of somewhat lower immunity less quickly attained, T.A.M. or T.A.F. should be chosen. For nurses and busy adults T.A.F. should be employed as being less likely to produce local reactions. Re-Schicking two months or more after the last injection is recommended and those still susceptible should be given another course. Finally, a list is appended of the commercial firms supplying the necessary preparations and holding the Ministry's licence.

The *Lancet* underlines the importance of the subject in a leading article and stresses the fact that diphtheria if not prevented is of all our failures in our national health policy the most unforgivable. Progress in diphtheria immunization has been woefully inadequate and the writer finds difficulty in avoiding the conclusion that this is so principally because the public are ignorant of its benefits and because of lack of conviction within the medical profession, particularly among general practitioners. A. JOE.

Reprinted from "Bulletin of Hygiene," Vol. 15, No. 8.

Reviews.

THE PARASITES OF MAN IN TEMPERATE CLIMATES. By Thomas W. M. Cameron. Toronto: The University of Toronto Press. 1940. Pp. xi + 182. Price \$3.00.

This small volume written by the Professor of Parasitology of McGill University is mainly concerned with non-academic descriptions of the parasites of man that actually occur in North America or Great Britain and their eradication. The author indicates that the book is not intended for the specialist but rather for the general practitioner.

The book is divided into sections dealing with protozoa, helminths, and arthropods, but there is no account of classification and the arrangement within these sections is not in the usual zoological sequence. The book falls midway between a textbook on Medicine and one on Parasitology and it may appeal to certain practitioners who may wish to know more of parasitology than is taught in the normal curriculum. It would be difficult, however, for the average reader who has not had the advantage of previous practical knowledge of the subject to obtain an accurate picture of many of the parasites for the descriptions are not always sufficient, simple and clear. The treatment of conditions brought about by the presence of parasites known to be pathogenic is given full consideration and the drugs recommended are those in common use by the majority of practitioners. Many useful parasitocides are also described.

The book is very well produced; it contains some excellent illustrations and much information that is not commonly found in the more academic publications.

H. J. B.

INJURIES OF THE JAWS AND FACE, with special Reference to War Casualties. By W. Warwick James, *O.B.E.*, *F.R.C.S.*, *L.D.S.Eng.*, and B. W. Fickling, *F.R.C.S.*, *L.D.S.Eng.* London: John Bale & Staples Limited. 1940. Pp. xi + 200. 194 Illustrations. Price 15s., postage 6d. extra.

Ever since the war clouds burst over Europe, dental officers of the fighting and emergency medical services have wished for an up-to-date reference book on war injuries of the jaws, written from the essentially dental aspect by an author of extensive experience. The available literature on the subject, dating mainly to the last war, is limited, scattered and not readily accessible, while the valuable Report of the Army Advisory Standing Committee on Maxillo-Facial Injuries (1934) is confined by terms of reference to a brief outline of general principles. This book is, therefore, most opportune and the authors are to be thanked for a concise, practical guide, which should be studied by every dental officer and, with advantage, by all medical officers. It was a major dental tragedy of the Great War that the authorities, with the lapse of time, ultimately destroyed the case histories,

radiographs and photographs of the thousands of jaw cases treated at the various home hospitals when these closed down and it was a happy thought of Mr. James to preserve for future study some odds and ends of material of his cases at the Third London General Hospital, for the book is mainly based on his collection. Only those who have attempted to piece together disconnected notes, radiographs, models and appliances, frequently without identification and date, can truly appreciate the labour and patience required and the several months taken for the analysis of the material and preparation of the book are readily understood. Starting with organization, the specialized nature of the injuries and the necessity for trained particular teams to deal with them at the outset are stressed. The significant anatomical features which influence the character of the injury, its diagnosis and treatment, physiology of bone repair, radiographic technique and interpretation, are next considered, followed by the impact effects of missiles on the soft and hard tissues, with the types of wounds produced, a thorough understanding of which is essential for successful treatment. The bulk of the book is then given to emergency, preliminary and special treatments, so extensively illustrated and lucidly described that the whole sequence from time of wound is easily followed, and these will be the chapters most closely studied. So wide a field permits of much variation in operative and prosthetic procedure and techniques favoured by the authors are given due prominence though the alternatives are also considered. Eyelet interdental wiring is recommended whenever possible and there is no doubt it is coming increasingly into favour, especially in the preliminary stage. The illustrated appliances and supports for the hard and soft tissues are models of prosthetic ingenuity, skill and delicacy. Complications are outlined and effective treatment, including chemotherapy, described, while a chapter is given to the bone grafting technique developed at the Third London General Hospital, the book closing with a valuable statistical analysis of the material on which it was prepared. A particular feature which will be much appreciated is the large number (194) of illustrations, including several of cases twenty years after treatment. These are of the utmost instructional value and greatly enhance the practical guidance which was the object of this book's preparation and which will contribute markedly to its undoubted success. The general setting-up of the book is also a matter for compliment—large, clear type on excellent paper, subdivision into paragraphs with prominent headings, and large illustrations. Lastly, in these days of mounting costs of production, the price of fifteen shillings is reasonable. The success of this publication is assured and the demand for it should necessitate further editions.

S. H. W.

FRACTURES. By George Perkins, *M.C., M.Ch., F.R.C.S.* Oxford University Press. London: Humphrey Milford. 1940. Pp. ix + 384. Price 20s. net.

The tabulation of material and directness of style are features well suited to the student's requirements. The subject matter relating to

fractures of the limbs and vertebral column is excellent, being clear, precise and well illustrated by diagrams which have been arranged to appear opposite the text to which they relate. The section on fractures around the elbow is especially good and the reader will find an informative account in the general introduction of the changes which take place in the soft tissues and the methods of their treatment. G. M.

MINOR SURGERY. By R. J. McNeill Love, M.S., F.R.C.S. London : H. K. Lewis and Co., Ltd. 1940. Pp. viii + 370. Illustrations 155. Price 12s. 6d.

Mr. McNeill Love's small books are well known to students and nurses. He has now added to the series with a useful and well-illustrated small book intended primarily for surgical residents and the general practitioner who has time to do his own minor surgery. It is no easy task to confine the subject matter within the limits of what may be considered "minor" surgery, but on the whole the author has succeeded. It is good to find that he encourages "open dressings" for clean surgical wounds, and utters a warning against the tendency to rush in with a scalpel in treating septic infections.

D. C. M.

REGAIN YOUR FIGURE. HOW TO RECOVER THE FIGURE AFTER CHILD-BIRTH, WITHOUT "STRENGTHENING" EXERCISES. By Lieutenant-Colonel J. K. McConnell, D.S.O., M.C. London : Methuen & Co. Ltd. 1938. Pp. xii + 128. Price 6s. net.

Lieutenant-Colonel J. K. McConnell has put a lot of thought and, may one add, ingenuity into his book "Regain your Figure."

His interpretation of the word "Strengthening," however, does not quite fit in with the accepted meaning of the word. The book describes yet another method of arriving at the same result as many another system of physical exercises but to say that those that follow his advice can do so without "Strengthening" exercises or conscious effort is scarcely true to fact.

The book is primarily intended for women who have recently gone through the trials of childbirth. By stressing this point so much the author gives one the impression that child-bearing must of necessity (forbid the thought) ruin a woman's figure unless strenuous, even if unconscious, efforts are made to rectify the "damage" done by what should be a physiologically normal procedure. Following the old principle that prevention is better than cure, the author could greatly improve his book by applying his undoubted knowledge to the problem of assisting the expectant mother to retain her muscle balance before the arrival of her baby and thereby reduce the necessity of regaining it after the babe is born. Most of the theories expounded in the book are very sound. The methods explained for the rectification of faulty posture, etc., are good but in no way unique.

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J. D.

The following book has been received :—

FIELD AMBULANCE ORGANIZATION AND ADMINISTRATION. Revised and amended edition. By Lieutenant-Colonel James Hardie Neil, N.Z.M.C., late O.C. No. 3 N.Z. Field Ambulance. London: H. K. Lewis and Co., Ltd. 1940. Pp. viii + 128. 5s. net.

Correspondence.

THE TREATMENT OF THE SOLDIER'S FOOT.

TO THE EDITOR OF THE "JOURNAL OF THE ROYAL ARMY MEDICAL CORPS."

SIR,—The communication on the above subject by Major Arthur J. Helfet, R.A.M.C., in your May issue is a very timely one but there are one or two comments I would like to make regarding his remarks on the treatment of *hallux valgus*.

Hallux valgus in civil life is most commonly seen in elderly people and I consider that, in the soldier, one is usually dealing with the adolescent type of *hallux valgus* which is so often the result of *metatarsus primus varus*, the treatment of which is by no means satisfactory.

Major Helfet, I venture to state, has been very lucky in his patients. The majority of soldiers with this deformity have suffered little, if any trouble, in civil life. Ordinary military training associated with the wearing of the Army boot, the leather of which is not always softened by the soldier prior to wearing, leads him to report sick with this pre-existing deformity which has only caused discomfort since joining the Army. The patient is not always co-operative; he blames the Army boot, and I question very much if we can "fit every soldier's foot to the standard Army boot."

The late Mr. W. H. Trethowan used to state that in a case of bilateral *hallux valgus* one should only operate on a foot which is giving trouble. If one advised and operated on both feet, the foot which had caused no trouble before would invariably give the poorer result.

Here we are dealing with a patient who is inclined to feel that his trouble is due to the Army boot and to Army life generally. On leave, he wears his civilian shoes, which, in all probability, cause him no trouble. Can we, therefore, expect him to co-operate to the extent required in this orthopædic operation ?

I think the results of operative treatment in these cases are too uncertain to justify the time expended and I agree with the authorities who discourage such methods in the case of soldiers.

Yours, etc.,

HERBERT J. GREEN,
Major, R.A.M.C.

Notices.

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JOURNAL OF THE ROYAL ARMY MEDICAL CORPS

Corps News.

JULY, 1941.

EXTRACTS FROM THE "LONDON GAZETTE."

May 23.—Col. W. L. E. Fretz, M.B., late R.A.M.C. (15682), having attained the age for retirement, retires on ret. pay. May 22, 1941.

Lt.-Col. (temp. Col.) J. G. Gill, D.S.O., O.B.E., M.C., M.B. (8368), from R.A.M.C., to be Col., May 22, 1941, with seniority July 1, 1937.

Maj. (temp. Lt.-Col.) E. S. Cuthbert (15375), to be Lt.-Col. May 22, 1941.

Short Service Commission.—The appt. of Lt. D. W. Bentinck (75590), is ante-dated to Nov. 1, 1937, under the provs. of Art. 39, Royal Warrant for Pay and Promotion, 1940, but not to carry pay and allces. prior to May 1, 1938.

Lt. D. W. Bentinck (75590), to be Capt. May 1, 1939, with seniority Nov. 1, 1938, and precedence next below Capt. A. F. Murray, M.B. (Substituted for the notfn. in the *Gazette* of May 5, 1939.)

May 27.—*Short Service Commission.*—Capt. C. E. Watson (67839), is placed on the h.p. list on account of ill-health. Apr. 16, 1941.

Capt. C. E. Watson (67839), h.p. list, retires on account of ill-health. Apr. 23, 1941.

The KING has been graciously pleased to approve of the following appt. :—

May 30.—Col. C. A. Wood, M.C., M.B., B.S. (Lond.), D.P.H. (Lond.), D.T.M. & H. (Lond.), (183717), Ind. Med. Serv., is appt. Hon. Physician to The King, Dec. 25, 1940 (vice Maj.-Gen. H. C. Buckley, M.D., F.R.C.S. (Edin.), Ind. Med. Serv., who has retired).

June 3.—Capt. (temp. Maj.) R. C. Langford (52028) to be Maj. May 15, 1941.

Short Service Commission.—Capt. C. W. A. Hughes (90374) to take rank and precedence in his Corps and in the Army, as if his appt. as Capt. bore date Mar. 31, 1941.

June 6.—Col. (temp. Brig.) W. H. O'Riordan, M.C. (5283) (late R.A.M.C.), retires, and remains empld. June 6, 1941.

The undermentioned, at their own request, revert to the rank stated whilst employed during the present emergency :—

As Majs. :—

Lt.-Col. A. C. Elliott, M.B. (8275), ret. pay, R.A.M.C. Apr. 3, 1940.

Lt.-Col. W. Davis, M.B. (9936), ret. pay, R.A.M.C. July 29, 1940.

Lt.-Col. A. T. Frost, O.B.E., M.B. (10561), ret. pay, R.A.M.C. July 29, 1940.

Maj. G. D. Jameson (20698), R.A.M.C., is restd. to the rank of Lt.-Col. on reversion to ret. pay. May 15, 1941.

June 10.—The undermentioned at their own request, revert to the rank stated whilst empld. during the present emergency :—

As Majs. :—

Lt.-Col. C. E. W. S. Fawcett, M.B. (11041), ret. pay (late R.A.M.C.). Apr. 3, 1940.

Lt.-Col. C. Scaife, M.D. (11031), ret. pay (late R.A.M.C.). Apr. 3, 1940.

Lt.-Col. D. P. Watson, D.S.O., M.B. (9931), ret. pay (late R.A.M.C.). Apr. 3, 1940.

June 13.—Lt.-Col. (temp. Col.) S. M. Hattersley, M.C., M.D. (1809), from R.A.M.C., to be Col. June 6, 1941, with seniority. Sept. 20, 1938.

Lt.-Col. D. C. G. Ballingall, M.C., M.B. (8521), retires on ret. pay on account of ill-health. June 4, 1941.

The undermentioned Majs. to be Lt.-Cols. :—

(Actg. Lt.-Col.) J. M. MacKenzie, O.B.E., M.C., M.B. (14371). June 4, 1941.

(Temp. Lt.-Col.) H. J. Bensted, M.C. (15778). June 6, 1941.

Regular Army Reserve of Officers.

May 27.—Capt. (temp. Maj.) P. G. Tuohy (5906), to be Bt.-Maj. Mar. 2, 1941, under the provs. of Art. 168, Royal Warrant for Pay and Promotion, 1940.

Lt. (War Subs. Capt.) C. G. Harper (150212), from Gordons (Res. of Off.) to be Lt. (War Subs. Capt.), Apr. 29, 1941, with seniority as Lt. Aug. 1, 1925.

TERRITORIAL ARMY.

June 6.—Maj. D. H. Lloyd-Williams (7765), from R.A.M.C. (temp. commn.), to be Maj. Sept. 2, 1939, with seniority July 11, 1935. (Substituted for notfn. in *Gazette* (Supplement) dated Dec. 5, 1939.)

Capt. E. H. Jaques, M.B. (62751), relinquishes his commn. on account of ill-health. June 7, 1941.

Capt. (Qr.-Mr.) W. N. Maddy (47245) relinquishes his commn. on account of ill-health, June 7, 1941, and retains his rank.

QUEEN ALEXANDRA'S IMPERIAL MILITARY NURSING SERVICE.

May 20.—Sister Miss M. E. Lindsay resigns her appt. Apr. 30, 1941.

May 27.—The initials of Sister Miss J. F. M. Brims are as now described, and not as in the *Gazette* of Mar. 28, 1941.

The following Staff Nurses to be Sisters :—
Miss J. W. Dicks, Dec. 1, 1940, with seniority next below Miss M. Hellen.

Miss M. J. Busher, Dec. 23, 1940, with seniority next below Miss M. J. Verity.

The following members to rank as Sisters with seniority Jan. 30, 1941 :—

Miss M. M. Baldwin.

Miss I. D. Hearn.

Miss E. F. Shine.

Miss A. M. Baker.

Miss E. M. Talbot.

Miss R. M. N. Mansel.

Miss W. Wright.

Miss S. Rhys-Jones.

Miss D. St. J. Blackman.

Miss L. M. Holland.

Miss M. L. Holmes.

June 10.—The undermentioned Sisters resign their appts. :—

Miss E. E. MacDonald. Oct. 31, 1940.

Miss J. R. R. Brown. Jan. 17, 1941.

Miss M. H. Strickland. Apr. 15, 1941.

Miss W. D. Lindsay-White. May 20, 1941.

June 13.—The surname of Miss Rowan Muriel Nona MANSELL is as now described, and not as in the *Gazette* of Nov. 5, 1940, Apr. 8 and 25, 1941.

ROYAL ARMY MEDICAL CORPS AND THE ARMY DENTAL CORPS COMFORTS GUILD.

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DEATHS.

SUTTON.—In Tunbridge Wells, on Apr. 12, 1941, Major-General Alexander Arthur Sutton, *C.B.*, *D.S.O.*, late R.A.M.C., Retired. Born Nov. 30, 1861, he took the L.R.C.P. Edin. and the L.R.F.P.S. Glasgow in 1884. Commissioned Surgeon Aug. 1, 1885, he was promoted Surgeon Major Aug. 1, 1897, Lieut. Colonel R.A.M.C. Aug. 1, 1905, Colonel Mar. 1, 1915, and Major-General Dec. 26, 1917. He retired Jan. 6, 1922. He served in the Protectorate Expedition in Sierra Leone 1898–1899 being severely wounded and receiving the Medal with Clasp. In South Africa he took part in the operations at Paardeberg (slightly wounded); actions at Poplar Grove, Karee Siding, Vet River, and Zand River; actions near Johannesburg, Pretoria, and Diamond Hill. Mentioned in despatches he was awarded the *D.S.O.*, Queen's Medal with four clasps and King's Medal with two Clasps. He served on the Staff as D.D.M.S. in Macedonia from 1915 till 1917. Twice mentioned in despatches he was created *C.B.* and awarded the Order of St. Sava, 3rd Class, 1914–15 Star, British War and Victory Medals. His two sons are serving in the Corps.

Capt. P. J. Martin, R.A.M.C., writes :—

“It was twenty-eight years ago that I

first met General Sutton when he arrived home from West Africa to assume command of the Royal Army Medical Corps Depot, at that time in Aldershot. I accompanied him to Salonika in 1915, where he was appointed D.D.M.S. Base and Lines of Communication Area, and although our paths differed from 1916 onwards, when he returned home to command the R.A.M.C. Depot at Blackpool, whence he retired, his charming personality made such an impression that the time I served with him has always been for me one of the happiest recollections of a lifetime spent in the Royal Army Medical Corps.

“To know him was to love him. Literally thousands of officers and men of my generation in the Corps will mourn the loss of an ideal Commanding Officer, who invariably tempered his great powers of discipline with a friendliness and kindness of nature which only his inner knowledge of the men he commanded made possible.

“With General Sutton the welfare of his men and their dependants was the first consideration. I remember him so well on the outbreak of the last war, when the depot at Aldershot had to take so many men of Kitchener's Army at such short notice. He worked unceasingly for their comfort and often remained with them

until the early hours of the morning until he saw them comfortably bedded for the night

"My generation was indeed fortunate in having such a man as guide and friend, and all of us who had the honour of serving under him owe him a debt of gratitude which can never be repaid.

"The thousands who knew him will grieve the passing of a great gentleman whose greatest concern was the well-being of the young soldier and, whose enthusiastic zeal for the Corps, of which he was such an eminent member, he so successfully instilled into others."

AHERN.—In Dublin on May 10, 1941, Lieut.-Colonel Michael Ahern, *O.B.E.* Born Sept. 6, 1876, he took the L.R.C.P., L.R.C.S., Edinburgh, and the L.R.F.P.S. Glasgow, in 1902. Commissioned Lieut. R.A.M.C., Jan. 30, 1904, he was promoted Capt. July 30, 1907, Major July 1, 1915, and Lieut.-Colonel Aug. 18, 1926. He was employed under the Colonial Office on the Gold Coast from the end of 1924 till the beginning of 1927. He was awarded the *O.B.E.* in 1919. His sons Major T. M. R. Ahern and Capt. D. M. Ahern are serving in the Corps. His brother, Colonel David Ahern, *D.S.O.*, late R.A.M.C., who retired in 1935, rejoined on mobilization in 1939.

EDITORIAL NOTICES.

The Editor will be glad to receive original communications upon professional subjects, travel, and personal experiences, etc., which should be in duplicate if possible according to King's Regulations.

Correspondence on matters of interest to the Corps, and articles of a non-scientific character, may be accepted for publication under a *nom-de-plume*.

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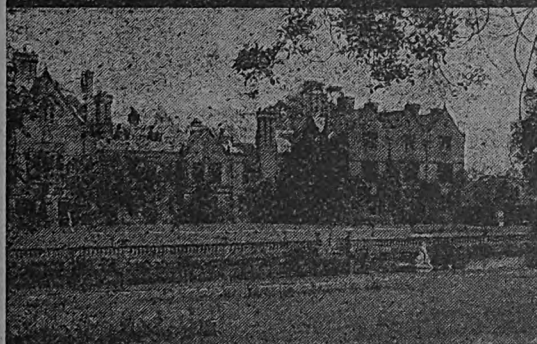
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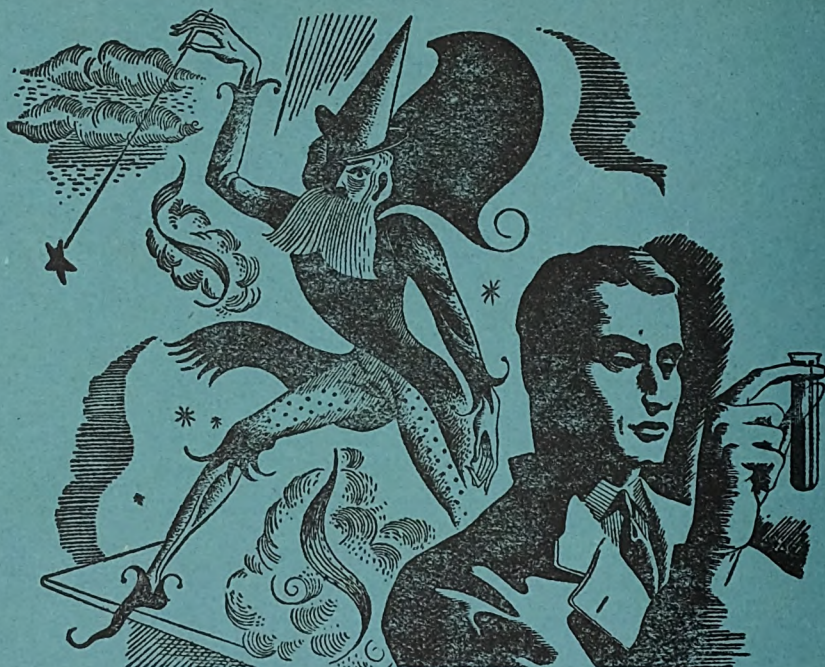
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Vol. LXXVII.

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MONTHLY

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GE 1059

'PROSTIGMIN' IN SURGICAL CONDITIONS**ABSTRACTS****FROM BRITISH AND AMERICAN LITERATURE****POSTOPERATIVE DISTENSION**

In commenting on the treatment of postoperative abdominal distension it is pointed out that the tone of the alimentary tract is controlled by the balance of power between the sympathetic and parasympathetic systems. Though inhibition of peristalsis after operation is regarded as physiological, restoration of function should not be too long delayed. Posterior pituitary extract given intravenously is effective but upsetting to the patient whilst if injected intramuscularly is less effective. Eserine is less effective than 'Prostigmin,' which cannot be called a stimulant in the usual sense as it merely preserves the acetylcholine from hydrolysis. In doses of 1 c.c. (0.5 mg.) given subcutaneously and repeated in an hour if necessary 'Prostigmin' will initiate peristalsis especially if followed by a glycerin enema. In obstinate cases a third dose is given combined with acetylcholine.

Lancet, 1940, ii, 212.

APPENDICITIS AND PERITONITIS

The authors report on a series of 32 cases of appendicitis complicated by general peritonitis with a poor prognosis. Paralytic ileus was prevented by giving 'Prostigmin,' the use of which was not contra-indicated in a single case. It was given pre- and post-operatively in doses of 0.5 mg. without mishap, even to patients four months pregnant. Injections of 0.5 mg. were given postoperatively every four hours when necessary. Not a single death was recorded in the series, although the mortality rate in the past using orthodox treatment has been variously reported from 22 to 63.6 per cent.

American Journal of Surgery, Sept., 1939, 45, p. 528.

POSTOPERATIVE RETENTION OF URINE

'Prostigmin' was used with highly satisfactory results in a series of 85 surgical cases to prevent postoperative dysuria. Findings were compared with the same factors in 318 control cases. The incidence of dysuria, specifically functional urinary retention, was reduced from 27.6 to 6 per cent. and the time interval elapsing between operation and spontaneous urination was reduced from 23.5 to 10 hours. The author recommends the routine employment of 'Prostigmin' as an effective preventive of postoperative urinary bladder atony and retention.

The Urologic and Cutaneous Review, February, 1940.

RADIOLOGY

A review is made of the uses of 'Prostigmin' and its freedom from side-effects when compared with eserine. The presence of intestinal flatus often results in poor definition in X-ray films of the abdomen, and in order to obviate this, 37 cases were treated by preliminary injections of 'Prostigmin.' Each patient received 2 c.c. (1 mg.) the night before examination and a similar dose the following morning, one hour before taking the X-ray photograph. No untoward effects were noted and very satisfactory films were obtained.

New England Journal of Medicine, Aug. 25, 1939, p. 270.

Footnote.—'Prostigmin' is the trade-mark of a parasympathetic stimulant and is chemically an eserine analogue, but more stable and less toxic than eserine. For surgical conditions it is issued in 1 c.c. ampoules in boxes of 6 and 50. Further particulars are obtainable from the manufacturers, Roche Products Ltd., Welwyn Garden City, England.

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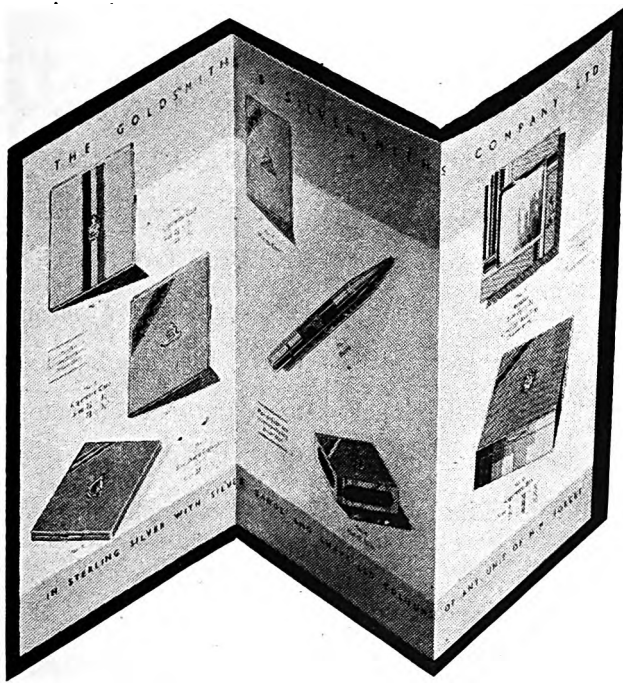
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Original Communications.

OBSERVATIONS ON CASUALTIES FROM THE WESTERN DESERT AND LIBYA ARRIVING AT A BASE HOSPITAL.

BY MAJOR G. A. G. MITCHELL, CH.M., MAJOR N. J. LOGIE, F.R.C.S.,
AND MAJOR R. S. HANDLEY, F.R.C.S.

Royal Army Medical Corps.

THIS article was inspired by a remark made by a medical officer that R.A.M.C. personnel working in forward and line of communication areas were anxious to know the results of their treatment. Between us we have seen almost seven hundred British and Italian casualties, men wounded in every region of the body, including many injured five to nine days before admission, and we have attempted to assess the value of varying types of treatment. Working under conditions of extreme difficulty and faced with problems of transport, supply, terrain and climate uncommon in other theatres of war, the medical officers in forward areas have achieved results which were admirable for the most part, as judged by the condition of the wounded on arrival at the Base. In certain cases, however, the measures adopted were less successful and it is from such that valuable lessons may be learned, lessons which emphasize that the canons of surgery can seldom be flouted with impunity. By selecting these cases we may apparently present a distorted review, but we have concentrated on the less successful results, not because we are actuated by the desire to criticize but because error rather than success is the great teacher. Incidentally medical officers would gain much useful information about the results of their treatment if they made more use of the official follow-up cards which are available.

FLESH WOUNDS.

Every case admitted had wounds of the soft tissues of varying severity, and many also suffered from damage to other structures. The less serious cases had had no treatment except one or more dressings, the favourite local applications being sulphanilamide and acriflavine, while all except a small minority had received prophylactic doses of anti-tetanic serum. Anti-gas gangrene serum was seldom employed.

The majority of the more serious wounds had been subjected to débridement or complete excision and the resulting cavities had been treated with sulphanilamide. Thereafter the procedure varied. Most of the wounds were left open but sometimes suture was attempted, sometimes the cavity was packed with plain gauze, and a few had been packed and partially sutured, an attempted compromise between open and closed treatments which usually failed. Undoubtedly those wounds which were left open did best. Examples of successful primary sutures were rarities, nearly all having become septic, so that the stitches had to be removed after arrival at the Base. The failures were due to incomplete or too late excision of damaged tissues, the presence of foreign bodies, tight suturing, insufficient drainage or lack of rest; the liberal use of sulphanilamide did not neutralize the neglect of these cardinal points. Loose packs produced no ill-results and may have helped to keep the sulphanilamide in contact with the wound surfaces. Tight packing was encountered several times, mainly in wounds of the extremities, and usually with deplorable results. Pain was excessive, the wounds were septic, the general condition was often poor, and there was the added disadvantage that removal was often impossible without an anæsthetic.

The question of drainage is a difficult one and is closely related to the procedure adopted after cleansing the wound but we believe that certain primary sutures would have succeeded had a separate drainage incision been made in the most dependent position, through which a jaconette or rubber drain could have been inserted. Drainage tubes were seldom employed and counter-incisions were conspicuous by their absence—not a surprising fact, for an infected area requiring such incisions on reaching the Base may well have had adequate drainage through the original wound when last treated. It was found that gauze packing was worse than useless as a method of draining sutured wounds on account of coagulation of the enmeshed exudate; well-vaselined gauze strips are more effective as drains than dry gauze, provided the suturing is not too tight.

A number of attempts had been made in forward areas to remove foreign bodies before radiography was possible and a high proportion of these operations were failures. Therefore unless a foreign body can be seen or felt, or is producing severe symptoms, it is unwise to attempt its removal until accurate localization has been effected and foolish to do a primary suture after such an operation unless all corners of the wound have been inspected.

This is especially true in areas where the presence of important structures or large muscular masses renders exploration difficult or dangerous.

When there are extensive or multiple wounds the advantages of splinting might be considered more frequently, and if tendons or nerves are severed the limb should be maintained by splints in the position most favourable for repair. This important principle of surgery was neglected in several cases and employed with excellent results in others.

HÆMORRHAGE.

We have mentioned that tight packing of wounds produced deplorable results. Such packs were doubtless inserted to procure hæmostasis and, were the journey between the various medical stations of short duration, no harm might result but, when days may elapse between their insertion and removal, this method should be avoided.

Realizing the difficulties of searching for a divided vessel when working in unfavourable surroundings, perhaps with inadequate instruments and defective lighting, we suggest that if a bleeding point cannot be secured and tight packing is used as a last resort, then the fact should be prominently noted in the Field Medical Card so that the packing can be removed at the first place where reasonable surgical facilities exist. In palmar wounds, where prolonged packing is particularly undesirable, the relative safety of arresting hæmorrhage by a palmar pad and a firm bandage over the clenched fist is worth remembering. The bandage can be slackened and readjusted by an orderly whenever necessary, whereas the pressure of a pack cannot be eased so simply. Incidentally, the search for bleeding points would be greatly facilitated if small self-retaining retractors were included in surgical haversacks and operating sets.

No cases were admitted wearing tourniquets but a few arrived in whom layer after layer of bandages had been firmly applied to a limb to control hæmorrhage. These had become saturated with dried blood and formed a rigid case constricting the limb, producing severe pain locally and oedema of the parts distally. If exploration and direct control of bleeding is impossible, then the lesser of two evils is the use of a pack rather than of layers of bandages.

Severe grades of anæmia were uncommon but several patients would have benefited from blood or plasma transfusions before being sent down the line.

CHEMOTHERAPY.

Chemotherapy was used frequently, sulphanilamide or sulphapyridine being given orally, applied locally to the wound, or the two methods were combined.

The dosage given by mouth varied considerably and the regularity of administration fluctuated as the patient passed from stage to stage of the journey. Calculations made from Field Medical Cards and other

documents showed that the amounts given were usually between 1 and 4 grammes daily—seldom more and often less. From a study of the condition of the cases on arrival at the Base we are convinced that those who received the larger doses of the drug showed less local sepsis and had fewer complications and we therefore believe that larger doses should be given orally as a routine and that local applications of sulphanilamide are also advisable because they provide a greater concentration of the drug in the vicinity of the infecting organisms. Oral administration should never be omitted, because local applications may be washed out of the wound if the discharge is profuse or the drug may all be absorbed and excreted within sixty hours. We are fortunate in having Major G. A. H. Buttle as a colleague, and after careful consideration of many cases we are in agreement that the present dosage recommended in official memoranda for the prophylaxis of wound infection is inadequate and we suggest that all wounds should be dusted with finely powdered sulphanilamide as soon as possible after wounding. The amount to be used must obviously depend on the size or number of the wounds, but the total applied should not exceed 15 grammes at one time. A further local application of a similar amount should be made in all severe injuries when surgical cleansing of the wound(s) is undertaken. Such applications would be greatly facilitated if medical officers and units were provided with cellophane packets or tubes each containing 5 grammes of finely powdered sterile sulphanilamide. Such packets might actually be enclosed in the first field dressing. Oral administration consisting of 3 tablets (1.5 grammes) thrice daily should commence as soon as possible, and certainly within twenty-four hours of the occurrence of the casualty, and should be continued for six days. The dates, times and the dosages given should be carefully recorded in the Field Medical Cards. In practice, as we have said, the doses were given sporadically and, in order to ensure regularity, a characteristic label might be provided which could be attached in a conspicuous position to men selected by medical officers for chemotherapy. Thereafter, wherever the man might go and by whatever method of transport the fact would be patent that he was receiving sulphanilamide and an orderly could go round at stated times with a supply of the drug, give 3 tablets to each man wearing the label, and at the same time record the fact by marking the card with an X in the appropriate place. It is simple to devise a printed label which reduces writing to an absolute minimum (figs. 1 and 2).

If serious infection supervenes, or if the wound is already infected when the man is first seen, then larger doses are required, for example 5 to 6 tablets every six hours (10 to 12 grammes daily) for the first two days, the dose being gradually reduced as the condition improves. Such doses were never given before admission even in severe cases. Should gas-gangrene develop or be suspected, sulphapyridine should be given instead of sulphanilamide because, although both act against *Cl. welchii*, the former is slightly more active against the *Cl. septicæ*. These larger doses are potentially

dangerous if continued for more than seven to ten days, but by that time the patient would have reached a unit where a blood examination could be performed. Apart from minor degrees of cyanosis no soldier was admitted

NUMBER	NAME	UNIT	DATE WOUNDED

INSTRUCTIONS FOR THE PROPHYLAXIS OF WOUND INFECTION.

Apply 5 - 15 gms. of powdered sulphanilamide locally as soon as possible and a further 5 - 15 gms after surgical treatment.

Commence oral administration of 3 tablets thrice daily within 24 hours of wounding and continue for 6 days.

Eggs, Epsom Salts, etc., should not be given during treatment.

RECORD ALL DOSES ON THE REVERSE SIDE OF THIS LABEL.

FIG. 1.—Front of label.

SULPHANILAMIDE			
RECORD OF LOCAL APPLICATIONS			
DATE		DATE	
5/10/15gms. APPLIED		5/10/15gms. APPLIED	
5/10/15gms. APPLIED		5/10/15gms. APPLIED	
RECORD OF ORAL DOSES.			
DATE	TIME	NO. OF TABLETS	
	HOURS		
	06.00	3	
	12.00	3	
	18.00	3	
	06.00	3	
	12.00	3	
	18.00	3	
	06.00	3	
	12.00	3	
	18.00	3	
	06.00	3	
	12.00	3	
	18.00	3	

FIG. 2.—Obverse of label.

In practice the labels could be white with a red border.

who had suffered from chemotherapy; a number may have suffered from the lack of it. It is interesting to record that we have twice found that

complications due to hæmolytic streptococcal infection can develop in patients receiving 8 grammes sulphanilamide daily.

As regards local applications sulphanilamide apparently produced better results than such antiseptics as eusol, acriflavine or hydrogen peroxide, and this was particularly noticeable in cases where the dressings had not been changed for three days or more. Under such conditions those treated with the usual antiseptics were often heavily infected, whereas those dressed with sulphanilamide were often surprisingly clean. Those wounds which had not responded so well to sulphanilamide were found to be infected with staphylococci—usually *S. aureus*.

Whether or not the best method of applying the drug locally has yet been found is questionable. Application to deep or complicated cavities is always difficult, for example to the knee-joint or to large wounds made by modern missiles where the underlying damage is often so much more extensive than the size of the superficial wound would lead one to expect. In cases arriving at the Base it was found that in superficial wounds the powder was more adherent to the dressings than to the raw surface and was removed with the soiled dressings while, in many cases, it was apparent that incompletely crushed tablets had been used both for surface application and for insertion into cavities. Thus in cases with deep wounds irregular masses were found to be extruding from the cavities and sulphanilamide in this lumpy state can scarcely be expected to exert its maximum effect.

In co-operation with Major G. A. H. Buttle we have been experimenting with various methods which could be employed in forward and line of communication areas. For example in surface wounds sulphanilamide may be used as a fine powder applied evenly under a vaseline spread (in our opinion the best method); as an ointment (5 grammes sulphanilamide to one ounce vaseline) applied directly to the wound or spread on gauze or lint; in the form of a solution containing 5 per cent sulphanilamide, 20 per cent dextrose and 4 per cent sodium bicarbonate, in which the dressings may be soaked or which may be sprayed on the wound, left for ten to fifteen minutes, and then covered by a vaseline spread. This last method produces a thin adherent film of the drug over the entire wound area. For deep cavities and complicated spaces a solution containing 5 to 8 per cent sulphanilamide in 80 to 100 per cent glycerine provides an easy method of introducing the drug to every recess and it also makes an almost non-adherent dressing for more superficial wounds.

FRACTURES.

Very few fractures had been missed. All others had been treated in orthodox ways, and the great majority arrived in excellent general condition. Most of the fractures were compound and comminuted and many were complicated by involvement of joints, vessels or nerves. Nearly all these had been operated upon and fixed in wooden, wire, or improvised splints, in plaster or, in the case of fractured femora, in Thomas' splints. The few

who arrived in poor condition had other injuries, usually visceral, or their wounds had become heavily infected.

The results being generally so effective, we have little to offer in the way of constructive criticism. Plaster of Paris, the best form of support for most limb fractures, might have been used more often and, when it was employed, the casings were sometimes too short or too thin for adequate support although this may have been due to a scarcity of plaster in the forward areas. The use of plaster slabs was not sufficiently appreciated. These can be held in position by a few circular turns of a plaster bandage, the result being a case very thick and strong in one sector to give adequate support, and so thin elsewhere that it may be cut with ordinary scissors should the need arise (actually we saw no instance of damage from too tight a plaster). Plaster splints composed entirely of circular turns are less strong, weight for weight, than those employing the girder principle, and their uniform thickness precludes their easy removal without special instruments. The slab method, therefore, not only saves plaster but also possesses definite advantages over the circular method of application. When removal of the case is likely to be required within two or three weeks, vaseline smeared over the skin prevents adhesion of the plaster to the hairs, thus avoiding what we found to be a common cause of pain and inconvenience. In addition if an open infected fracture exists vaseline helps to protect the skin from secondary infection.

Men with fractured femora had their injured limbs fixed in Thomas' splints but extension was usually omitted. No spring boot clips were in evidence and we conclude they are not available; the alternative clove-hitch and windlass method was only seen once. The limbs were well fixed, so no great shock had resulted but, nevertheless, extension is desirable though heavy traction is not required to enhance the efficiency of the fixation. Cases have been reported where a tightly applied clove-hitch had caused sloughing and, during the long journey from the desert front, this would have been very liable to occur. Some such thought may have been in the minds of the medical officers who neglected this method of extension. The rings of the splints often bore no relationship to the size of the thigh, and the provision of splints with adjustable rings or detachable rings of varying sizes would be a useful addition to the medical equipment. Colonel Monro, Consulting Surgeon, M.E.F., has suggested that in fractures of the lower limb the use of posterior plaster slabs, with plaster bandage ties incorporating the side bars of a Thomas' splint, would give better fixation than the splint used alone. In two cases where we saw this method employed—one an officer with a compound fracture of the femoral condyles and the other a serjeant-pilot suffering from a fracture-dislocation of a knee—the results were excellent and the method deserves wide adoption.

Those with fractures in the region of the knee-joint or of the leg bones were more comfortable in plaster cases than in Thomas' splints alone. Tightly laced boots were a source of discomfort in several cases and if the

boots are not removed the laces should be cut. Of cases with fractured humeri some had splints and some had none but all wore wide or narrow fold slings and a few had the arm bound to the side by a binder, an arrangement which proved most comfortable.

The battle casualties with fractured ribs or pelvis had penetrating or perforating injuries of the chest or abdomen and those with fractures of the skull or vertebral arches had evidence of damage to the brain or spinal cord. The visceral lesions overshadowed the symptoms and signs of the fractures and no treatment of the bony injuries had been attempted. Three cases with fractures of vertebral bodies arrived without evidence of cord lesions, having been handled and transported correctly.

Only two men with severe cervico-facial injuries were admitted. One, who had had one side of his face and neck blown away nine days before, with great maxillary and mandibular destruction, could swallow nothing except small amounts of fluids and was slowly starving. A gastrostomy led to temporary improvement until a fatal bronchopneumonia supervened. He might have survived had a gastrostomy been done at an earlier stage. The other case was less severe, deglutition was scarcely affected, and he did remarkably well after wiring of the mandible and secondary suture.

AMPUTATIONS.

No amputation case arrived in good condition, this being due to various factors but particularly to insufficient general and local rest following operation. Some evacuated soon after operation died before they reached the Base and the others exhibited various degrees of surgical shock. When rapid evacuation of amputation cases is imperative, the journey may be made more tolerable if a plaster cap is applied which can be removed and replaced like a finger cot. Such caps keep dressings in position, minimize swelling, give support to the stump, and protect it from the minor traumata incidental to transport. The removal of the cap is facilitated if in the first place the skin is smeared with vaseline or covered with thin vaseline-gauze spreads.

Owing to skin destruction and other causes amputations in war casualties cannot always be performed at the sites of election and unorthodox skin flaps or shortish stumps may be unavoidable, but too long stumps and too tight suturing of skin flaps are avoidable. We saw one case of Syme's amputation where sepsis had supervened with partial sloughing of the heel flap. Secondary hæmorrhage occurred ten days after the initial operation necessitating reamputation through the leg. As it is more difficult to fashion a prosthesis for a Syme's amputation than for one at the site of election, should not the former method be discarded?

Men with guillotine amputations were all dangerously ill on arrival. They all had severe pain, their wounds were heavily infected, the stumps were acutely tender, and loss of serum was a pronounced feature. A

guillotine amputation is necessary only in the gravest cases ; in the others the few extra minutes required to fashion and loosely suture short skin flaps may increase the operative risk slightly but this is more than counter-balanced by the greater safety and comfort of the subsequent journey. This lesson was clearly impressed upon us by a comparison of the various types of amputation. The increasing availability and use of blood and plasma will greatly reduce the necessity for extreme haste.

The mention of haste raises another problem. Two men were admitted with guillotine amputations performed through the head of the tibia, about two inches below the joint, almost the thickest part of the bone. As re-amputation would clearly be required, disarticulation through the knee would have been easier and would have meant less hæmorrhage, less shock, less subsequent loss of serum, less pain, and less septic absorption from the largely cartilaginous and tendinous raw areas left, while short skin flaps might have been fashioned from the skin which in both cases was intact at the level of tital section. The moral is this: disarticulation should be performed in every case where a guillotine amputation would otherwise be necessary immediately below the elbow or the knee.

Skin retraction in guillotine amputations always occurs and some form of skin extension is essential ; otherwise the surgeon who reamputates may have to sacrifice more bone than is desirable. This extension should be applied at the time of operation and U-shaped elastoplast straps fixed over the stump dressing do much to counteract shrinking ; thereafter a plaster cap can be applied. A more elaborate method is to fix elastoplast extensions to the skin, apply the appropriate Thomas' splint and tie the strapping under tension to the side bars or end-piece.

One last point, interesting though not strictly apposite, may be interpolated here. Four men with amputations had a note in their Field Medical Cards to the effect that the ablations had been performed for "gangrene," and anti-gas-gangrene serum and sulphanilamide had also been given. Anaerobic infection, therefore, was either diagnosed or suspected. If they were suffering from gas-gangrene the recovery rate contrasts forcibly with our experience of similar cases treated days later at the Base where only one of six proved cases survived—sad confirmation of the dangers of delayed treatment in these infections.

WOUNDS INVOLVING THE BODY CAVITIES.

Cases with spinal and cranial injuries withstood the ordeal of the journey better than those suffering from wounds of the other body cavities. One case with a hernia cerebri had signs of a meningo-encephalitis, but whether he contracted the infection at the time of injury or later it is impossible to tell ; three other similar cases arrived in good condition. A soldier, paraplegic from the sixth thoracic segment downwards, had required frequent catheterization and had developed a severe cystitis and urethritis. Quite

apart from the danger of infection, instrumentation is a difficult matter during transport, and an early suprapubic cystostomy helps to circumvent both these problems. Instructions could be given to an orderly *re* regular emptying and absorbent dressings would minimize the risk of bed soiling and consequent skin irritation. Protection of anæsthetic skin over pressure points such as the sacrum and heels is imperative, a pad of wool retained in position by bandages or adhesive plaster being efficient ; strapping alone does much to prevent direct friction, but may itself produce skin irritation. Two paraplegic cases had sacral pressure sores and one a heel sore which had not been treated before admission.

Men with penetrating and perforating abdominal and chest wounds should not be sent further than is absolutely necessary as, in our experience, they travel badly. Twenty chest and eleven abdominal cases which were admitted were all seriously or dangerously ill. The most careful selection should be made before men with such injuries are subjected to a prolonged and at the best of times trying journey. A true assessment of the progress of such cases, favourable or unfavourable, can only be made by constant observation, preferably by the same person, and this is a sound reason for retaining these cases as long as possible at the first point where a surgical team is located. It is courting disaster to send soldiers with abdominal wounds straight to the Base, even those which are apparently simple, for it is axiomatic that any wound of the abdominal parietes should be treated as a wound involving the peritoneal cavity until this can be definitely disproved. The following two cases illustrate this point : one man had an intestinal obstruction as a result of a small perforating abdominal wound five days before and another with a similar injury had developed a general peritonitis and ileus. We have been able to verify the already well-established facts that the size of an entry wound may bear no relationship to the amount of internal damage and that wounds of the buttock, groin and perineum are often complicated by injuries to abdominal or pelvic viscera or to the urethra. The danger of overlooking a ruptured urethra was well exemplified in a man who was found on arrival to have widespread extravasation of urine from such a lesion with gangrene of all the superficial tissues of the perineum and genitalia ; he died a few days later from secondary hæmorrhage. Recovery might have occurred had an early suprapubic cystostomy been performed and free drainage provided at the site of extravasation.

The remarks about abdominal cases apply with almost equal force to chest injuries and the fact that wounds of the root of the neck or shoulder regions are liable to be accompanied by intrathoracic lesions was sometimes forgotten. Several men who arrived with large accumulations of blood or sanio-pus in a pleural cavity would have suffered less cardiac and respiratory embarrassment had a paracentesis been performed before evacuation. This procedure may tend to restart hæmorrhage but this danger can be averted by air replacement and by retaining cases for twenty-four to forty-

eight hours after paracentesis. It would then be easy to determine whether fresh bleeding had occurred and if not the subsequent journey could be made in relative comfort and safety. One man with a sucking pneumothorax came under observation with such overwhelming infection of the pleura and parietes that he was beyond surgical aid.

This article was written before we knew that an Official Memorandum (M.E. Technical Instructions, 1941, No. 3—War Surgery) was in the course of production and it is significant that, broadly speaking, the conclusions are similar, although the Memorandum deals chiefly with experiences in other theatres of war.

We wish to express our thanks to Colonel H. J. A. Longmore for permission to forward this article for publication and to our medical and nursing colleagues on the staff of the Hospital who have helped us in innumerable ways in the treatment of our cases. We are especially indebted to Colonel Monro, Consultant in Surgery, G.H.Q., M.E., for much helpful criticism and advice.

INTENSIVE TREATMENT OF GONORRHOEA AND NON-SPECIFIC URETHRITIS WITH SULPHAPYRIDINE.¹

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THE effectiveness of sulphapyridine in the treatment of gonorrhœa has never been seriously questioned. From the first results were universally good and led naturally to a spirit of extreme optimism which has now given place to the realization that there are problems still to be solved, not the least of which is the difficult problem of dosage. From the many and varied schemes of treatment which are used it is clear that there is no general agreement as to the routine dosage which will produce the highest proportion of good results while yet avoiding undue toxic effects. Most workers in the subject now stress the importance of a high constant level of blood sulphapyridine maintained by giving larger doses at first followed by smaller doses at short intervals; and certainly the general experience is that to give small doses at first is to risk disaster in the form of the resistant or "sulphonamide fast" case. Bowie, Anderson, Dawson and Mackay (1939) were the first to record their experiences with massive initial dosage followed by rather large doses over a short period. In the course of review of experience with various schemes of dosage they described the effects on 23 men with gonorrhœa of the following treatment:

4 grams of sulphapyridine at once, 2 grams of sulphapyridine after four hours, then 1 gram every four hours during the waking periods, the total dosage spread over seventy-two hours, making a total of from 15 to 20 grams. This has been called the "8—4—2" treatment, from the number of tablets administered at successive intervals, and also the "Aberdeen method." Treatment given by this or similar schemes will be referred to in this paper as "Intensive Treatment." Of the 23 patients in this series twenty were cured without further treatment and one was probably so cured. In this group there was a high incidence of unpleasant although not serious toxic reactions and, although these patients were actually treated as out-patients, the desirability of strict control of such treatment under in-patient conditions is clear. This probably accounts for the fact that there are few records in the literature of the use of this treatment. It was to be anticipated that a method which, under conditions of strict observation and control, promised to give rapid and efficient results would be of considerable interest to the fighting services and, in fact, the other two publications which we have traced

¹ A paper read to the Medical Society for the Study of Venereal Diseases in London on March 25, 1941.

came from this source. Buist and Simon (1940) treated 20 men suffering from fresh uncomplicated gonorrhoea according to the scheme of dosage outlined above. All responded to the treatment and the average length of stay in hospital was 5.3 days. During periods of observation, and tests varying from two to three months, one relapse occurred.

Petro (1940) treated 100 patients, 27 of them with a course almost identical with that first used by the Aberdeen school, in which the period of treatment was seventy-two hours and the tablets were given during the day only, the total sulphapyridine in each case amounting to 16 grams. The remaining 73 received a preliminary dose of vaccine consisting of twenty million gonococci, given intradermally, followed by a course of sulphapyridine consisting of 4, 2, 1 grams at intervals of four hours and then one gram four-hourly day and night for a total of forty-four hours. The amount of sulphapyridine administered in each case was again 16 grams. In the first group the average time taken to achieve clinical cure was 9.07 days. Three failed to respond but, in a follow up period of two months, there were no relapses in the successful cases. In the second group the average time before clinical cure was 6.7 days; two failed to respond and there was one relapse after apparent success. Toxic manifestations were of a minor character except in two cases, in one of which hæmaturia occurred and in the other renal colic with microscopic evidence of blood and crystals in the urine. In both cases the symptoms subsided promptly when the drug was discontinued. Failures were attributed to faulty drainage resulting from narrow external urinary meatus, from "pocketing" of infection in Littre's glands or from urethral stricture due to past infection.

DESCRIPTION OF CLINICAL MATERIAL.

In our series the total number of patients treated intensively was 502 including 397 whose urethral smears showed gonococci and 98 in whom the gonococcus was not found. Seven were suffering from infections such as cystitis which are not relevant to the present investigation.

Of the 397 patients with gonorrhoea 16 had had recent gonorrhoea treated with sulphonamide preparations and were presumed to have relapsed. Thirty-nine others gave the history of an attack of gonorrhoea in previous years. Five had received small doses of sulphonamide preparations before admission to hospital; but the dosage given was insufficient to produce any beneficial effect and all continued to show gonococci in smears.

Of the 98 patients diagnosed as suffering from non-specific urethritis 20 admitted to a previous attack of gonorrhoea and 10 to previous attacks of non-specific urethritis. One had had inadequate treatment with sulphonamide before admission. Most of the men in this group admitted having taken a risk of infection.

Almost all these patients reported sick at once when symptoms appeared and were immediately admitted to hospital for treatment. Of 397 men with gonorrhoea only 31 had had symptoms for more than one week. Of

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98 men with non-specific urethritis 14 had had symptoms for more than a week. The remainder in each category had noticed symptoms for periods varying from a few hours to seven days, but in the large majority treatment was instituted within the first three days.

Under these circumstances the number of patients with complications before treatment was started was small, as might be expected.

Among the patients with gonorrhœa there were : 6 cases of epididymitis ; 1 infection of Tyson's gland ; 1 infection of a para-urethral duct.

Among the patients with non-specific urethritis there were : 5 cases of epididymitis ; 1 case of fibrositis.

DETAILS OF TREATMENT.

The broad outlines of our scheme of treatment remained unchanged throughout the four months in which we used this intensive course but as our experience of the toxic effects of the drug grew a number of modifications were made. From the first all patients were kept strictly in bed, during the seventy-two hours in which they were taking sulphapyridine, on a "milk diet" consisting of two to three pints of milk daily with rice, bread and butter or margarine. Temperature was taken morning and evening. In 402 cases an initial dose of 8 tablets of sulphapyridine was followed by 4 tablets in four hours' time and thereafter by 2 tablets every four hours day and night to the seventy-second hour when the last dose was given—a total of 23 grams. 100 patients were treated by an 8—6—4—2 tablets scheme, a total of 25 grams. In all cases the actual taking of tablets was supervised so that doses could not be missed. In most cases the tablets were swallowed whole and a large drink of water given immediately afterwards. It was soon evident that as far as the patient was concerned the most troublesome effect of the treatment was the high incidence of vomiting. The suggestion was made that constipation might be a predisposing factor and therefore, in all later cases a "No. 9" pill, consisting of calomel grains ii, compound rhubarb pill grains ii, compound colocynth pill grains ii, was given at the beginning of the treatment. It seemed that the incidence of vomiting was slightly less in consequence. At first the possibility of severe damage to the bone marrow was feared and daily white cell counts were done. Later the cell count on the second day was given up, and finally a count was done on the third morning of treatment only unless there was some special indication at another time. Early morning smears and urine were examined daily during treatment. No urethral irrigations or other local treatments were given.

The incidence of certain renal complications—to be discussed later—brought in its train further additions to the routine. The daily fluid intake and output were measured, alkali was given by mouth, at first in the form of sodium bicarbonate, 1 drachm to the pint of water, in as large quantities as the patients could be persuaded to take (Long and Bliss, 1939)—and later as potassium or sodium citrate grains xxx two-hourly throughout the twenty-four hours since sodium bicarbonate of itself seemed to encourage

vomiting in some cases and was so unpalatable that difficulty was experienced in ensuring that it was taken in adequate quantities. Patients were of course examined daily and carefully questioned as to abdominal symptoms, particularly pain. The urine was watched for macroscopic and, in certain cases, for microscopic evidence of blood.

PROCEDURE FOR OBSERVATION AND TESTS OF CURE.

At the end of the three-day course of treatment patients were allowed up and were usually fit to perform light ward duties. After treatment close observation under in-patient conditions extended over a period of at least seven days and longer if there was doubt about clinical cure. In each case on three or four occasions during this period an attempt was made to obtain and examine a urethral smear before the first morning specimen of urine was passed. At the same time the first morning specimens of urine were examined by naked eye and the persistent presence of leucocytes in the smear during the period of observation, or of haziness or pus threads in the urine, was accepted as evidence that cure was not complete and that further observation or treatment was required. The repeated naked-eye examination of such all night specimens of urine by the experienced observer, supported by microscopic examination of threads when necessary, is probably the most reliable of all single tests for latency of gonorrhœa. This test is still more reliable if alcohol is taken beforehand. If at the end of seven days morning smears and urine were satisfactory the following tests were performed :

- (1) Rectal examination.
- (2) Microscopic examination of a prostatic bead.
- (3) Naked-eye examination of the urine after the prostatic massage.
- (4) Urethroscopy.

These tests were followed by another examination of morning smear and urine on the day after instrumentation. If all the tests were satisfactory the patient was discharged from hospital.

Arrangements were made with the man's unit for him to attend at hospital once a week for three weeks for urethral and prostatic smear and for examination of the urine. Finally, three months after discharge from hospital, each patient was re-admitted and all tests repeated with the addition of a complement fixation test for gonorrhœa on the blood-serum. If the tests remained satisfactory the patient was discharged as cured.

The difficulties of maintaining these standards under war-time conditions are obvious. Units are moved from place to place, from Command to Command and overseas. As far as possible these men have been followed through their period of three months' observation but there are large gaps in the information and these will be indicated. It may be argued that three months is too short a time for observation in view of the fact that relapses after treatment with sulphonamides have been described after longer intervals. The force of this criticism must be admitted but it is not possible

to provide for every contingency in a disease so variable in its outcome as gonorrhœa and, probably, the standards of observation and testing were as high as could be attained in the circumstances. The question of relapse is in any case a difficult one. No method of hard and fast distinction between relapse and reinfection has yet been devised. Histories are misleading and even the certain knowledge that sexual intercourse has taken place is no sure evidence that reinfection has occurred. It is well known that intercourse is one of the common factors which may convert latent into declared infection.

IMMEDIATE RESULTS OF TREATMENT.

For the purpose of assessing the effectiveness of this scheme of treatment in producing clinical cure each group is divided into three sub-groups according to the amount of treatment ultimately required and in each sub-group the average length of time that these patients were detained in hospital is indicated. This last is in many respects an inaccurate index of the success or failure of this treatment. In using a scheme of dosage with which we were unfamiliar it was a natural tendency to prolong rather than to shorten the period of observation. This also depended to a great extent, as it proved, upon the view of the individual medical officer. The facts that these men were drawn from a large and scattered Command and that units were often situated many miles from the Command treatment centre, had to be taken into consideration and demanded longer observation than would have been necessary in a compact area.

The sub-grouping is as follows :

Gonorrhœa.—The total number of patients was 397.

(1) Patients requiring no further treatment after three days' intensive treatment numbered 195, or 49 per cent of the total. The period of stay in hospital varied from 11 to 28 days, the average time being 13 days.

(2) Patients requiring a small amount of extra treatment such as one intravenous injection of T.A.B. vaccine or urethral irrigations for a few days only. These numbered 60, or 15 per cent of the total. In-patient stay varied from 15 to 38 days and the average was 23 days.

(3) Patients requiring a further course of sulphonamide irrigations and T.A.B. combined, or other combinations of these treatments, numbered 142 or 36 per cent of the total. Five of these patients in sub-group 3 are still in hospital after treatment for periods of from 83 to 110 days. The remaining 137 were in hospital for an average time of 44 days, the shortest period being 18 days and the longest 114 days.

"Sulphonamide Resistance."—Fourteen patients in this series were suffering from infections which proved "sulphonamide resistant" in that gonococci were still present in the urethral secretions when the intensive course of treatment was finished and persisted for variable periods from the fourth day up to three months. Bowie and his co-workers state, in their original article that, in a few cases, gonococci were present in a mucoid secretion at

the end of intensive treatment but disappeared at once, the patient making a prompt and satisfactory recovery. In our series this occurred in only one case, which is included in the first and most satisfactory group, since no further treatment was required and the patient was discharged from hospital after fourteen days. One other made a prompt recovery after an additional intravenous injection of T.A.B. and is included in the second group. The remaining twelve were very resistant and required prolonged treatment. They are included in the third group and one is among the five patients still in hospital.

COMPARISON WITH PATIENTS SUFFERING FROM GONORRHOEA AND TREATED WITH A ROUTINE NON-INTENSIVE COURSE.

For the purposes of this comparison the records were taken at random of an identical number of cases, 397, treated with a fourteen-day course of sulphapyridine consisting of 4 grams daily for three days followed by 3 grams daily for eleven days without irrigations. The standards of observation and tests were identical. The following is the result of assessment of these cases under the same headings :

(1) 198 or 50 per cent required no additional treatment. The length of stay in hospital varied from 12 to 37 days and the average was 30 days.

(2) 62 or 16 per cent required a small amount of additional treatment. Stay in hospital varied from 14 days (in a patient whose course was curtailed through toxic effects) to 29 days. The average length of stay was 20 days.

(3) 137 or 34 per cent required considerably more treatment. Stay in hospital varied from 20 to 223 days, with an average of 56 days. 26 of these cases, all included in sub-group 3, proved "sulphonamide fast."

NON-SPECIFIC URETHRITIS TREATED INTENSIVELY.

The total number of patients was 98, of which two became seriously ill as a result of treatment, one with fatal outcome, and are not included in this assessment.

(1) 27 or 28 per cent of the total (96) required no additional treatment. The length of stay in hospital varied from 9 to 23 days and the average was 13 days.

(2) 7 or 7 per cent required a small amount of additional treatment. Stay in hospital varied from 18 to 30 days, and the average was 23 days.

(3) 62 or 65 per cent required considerably more treatment ; for 57 of these the stay in hospital varied from 20 to 112 days and the average was 48 days. The other 5 are still in hospital after 75, 83, 100, 105 and 124 days respectively.

COMPARISON WITH PATIENTS SUFFERING FROM NON-SPECIFIC URETHRITIS TREATED WITH ROUTINE NON-INTENSIVE COURSE.

The records of 98 patients with non-specific urethritis who had received the routine fourteen-day course without urethral irrigations were taken at random.

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(1) 34 or 35 per cent of the total required no additional treatment. Stay in hospital varied from 15 to 32 days and the average was 21 days.

(2) 6 or 6 per cent required a small amount of additional treatment. Stay in hospital varied from 20 to 32 days, the average being 26 days.

(3) 58 or 59 per cent required considerably more treatment. Stay in hospital varied from 32 to 130 days ; the average was 60 days.

THE EFFECT OF DURATION OF THE INFECTION UPON THE RESULTS OF TREATMENT.

As previously stated the very large majority of these men began treatment during the first week following the onset of symptoms. Those with discharge for more than one week were only 27 in number and fall into the appropriate sub-groups as follows : (1) 14 or 52 per cent ; (2) 2 or 7 per cent ; (3) 11 or 41 per cent.

The average time of stay in hospital for all these cases was 27 days. Obviously conclusions cannot be drawn from this small number of cases but, for what the evidence is worth, there appears to be no difference between this group and the majority.

COMPLICATIONS OF INFECTION ARISING DURING TREATMENT.

Gonorrhœa Treated Intensively.

The following complications occurred : 1 case of epididymitis supervened on the third day, 1 case of arthritis of knee on the fourth day, 1 case of multiple arthritis on the seventh day and 1 case of latent prostatitis was discovered as the result of tests for cure.

Control Cases of Gonorrhœa.

There were 9 cases of soft stricture of the urethra and in one case a fibrous stricture was found at final test five months later in a man with no history of previous gonorrhœa. In addition there was one case of periurethral abscess and one of epididymitis occurring on the eighth day.

Non-Specific Urethritis Treated Intensively.

The following complications occurred : 1 case of subacute prostatitis occurring after 2½ months ; 1 case of arthritis of the knee on the tenth day ; 1 case of epididymitis in the seventh week ; 1 case of multiple arthritis beginning on the fourth day.

Control Cases of Non-Specific Urethritis.

Soft strictures were found subsequently in 5 cases ; there was 1 case of epididymitis on the sixth day and also 1 case of metatarsalgia on the eighth day.

Local Results of Treatment.

The difficulties of carrying this investigation to its ultimate conclusion have been indicated. As regards control patients it has been impossible

to obtain figures which would be of any value. Every effort has been made to obtain details of the later history of patients treated with the intensive method. Many are serving overseas and details are not yet available. Others did not start their treatment until the end of December and early January and, at the time of writing, are not yet due for their final tests. Of the patients with gonorrhœa 127 are known to have passed all their tests satisfactorily—78 from group (1), 19 from group (2), and 30 from group (3).

Of the patients with non-specific urethritis there are records of 22, 9 in group (1), 1 in group (2), and 6 in group (3), who have passed all tests.

Relapses.—From the group of patients with gonorrhœa 21 are known to have relapsed. Of these 15 were in group (1), 7 of these having positive smears; 1 in group (2), having a positive smear; 5 were in group (3), 2 of these having a positive smear.

From the cases with non-specific urethritis, 1 from group (1) is known to have relapsed and 2 from group (3).

These results are still coming in and the ultimate assessment will include a considerable proportion of the total number treated.

THE COMPLICATIONS OF TREATMENT.

Minor Toxic Effects.—Most of the complications were of a minor character although unpleasant and often distressing to the patient. These occurred in the following order of frequency: vomiting, headache, nausea and feeling of distension, anorexia, persistent low backache, insomnia, depression, leucopenia, skin rashes. Vomiting was the only symptom of this character which assumed important proportions. It occurred in more than 60 per cent and in half of these it was severe enough to cause considerable distress and to handicap treatment. Nevertheless, in no case was treatment stopped on account of it. The administration of alkalis in the form of sodium bicarbonate, 1 drachm to the pint of water, or of potassium or sodium citrate grains xxx two-hourly, seemed to control vomiting to some small extent. All patients were free from these minor complaints within twenty-four hours of the termination of the treatment.

White cell counts did not fall below 5,000 per c.mm. in any case; but in one instance in which the total count was 5,200 per c.mm. the percentage of polymorphonuclear leucocytes fell to 43 and it was thought advisable to stop treatment after 18 grams of sulphapyridine had been taken.

Rashes occurred in only three patients. One developed an urticarial rash, with swelling of the eyelids, on the third day of treatment. The other two developed rashes of the morbilliform type on the fifth and sixth days after the start of treatment respectively.

Major Toxic Effects.—The complications in this group were all of renal origin. Cases of renal intolerance to sulphapyridine are relatively uncommon but the subject is one which has accumulated a considerable literature. No less than 45 articles on this subject were found. The general experience

seems to have been remarkably uniform and corresponds closely with our own. The manifestations of intolerance tend to occur early, usually on or about the second or third day of treatment, and are of sudden onset. They have been described with both intensive and non-intensive dosage but seem to be more common with the former. Hæmaturia is the most constant and in many cases the first symptom of renal damage. Other symptoms are severe lumbar pain, often unilateral at first, which may require morphia for its relief, true renal colic, oliguria and anuria which, in some cases, in spite of treatment goes on to uræmia. Vomiting is usually persistent and severe. In several of our cases there was a marked abdominal distension, a symptom to which there appears to be no reference in the literature. In all cases sheaves of jagged crystals consisting of the acetyl derivative of sulphapyridine were found in the urine. There are records of ten fatalities and post-mortem investigation of some of these showed blockage of the vesical ends of both ureters with concretions formed of this crystalline deposit of acetylated sulphapyridine.

In our series of 502 patients treated intensively there were 5 cases of anuria. Two of these developed uræmia and one died in consequence. A description of both these cases will be given including details of post-mortem examination of the patient who died, which gave evidence of blockage of the vesical ends of both ureters although no actual concretions were found. All these patients had hæmaturia and lumbar pain. Two other cases of hæmaturia and two of severe lumbar pain occurred but anuria did not supervene. It is possibly significant that four cases of anuria, including the two in which uræmia developed, one of hæmaturia and one of lumbar pain, occurred in patients receiving the 8, 6, 4, 2 (tablets) dosage as opposed to the routine 8, 4, 2 dosage which the others were given. The records of over 2,000 patients treated by non-intensive therapy with sulphapyridine during the past year show that there have been two cases of anuria and three of hæmaturia. The two patients who suppressed were receiving three grams of the drug daily when the complication occurred.

The causes of this serious and potentially dangerous complication are not fully understood but there is evidence to suggest (Baines and Wien, 1939) that, whereas many if not all patients excrete up to 50 per cent of their sulphapyridine in the acetylated form, in only few patients does massive precipitation occur in the course of excretion. This may be due to idiosyncrasy but it seems clear that diminution of fluid excretion with consequent increased tubular concentration of sulphapyridine or its acetyl derivative, and perhaps acidity of the urine, increase the likelihood of deposition of crystals. It is interesting to note that renal complications, which developed in six patients receiving the 8, 6, 4, 2 dosage, occurred in rapid succession in a group of patients who were in the same ward at the same time. Previously 90 men had been treated similarly without mishap. Investigation of the circumstances showed that these men objected to, and either evaded or surreptitiously disposed of, the sodium bicarbonate

solution which they were ordered to drink. In the light of experience gained it seems probable that too much faith was placed in the administration of alkali with failure to make certain that sufficient fluid was taken. The bicarbonate solution was unpalatable and these men were convinced that it made them vomit. In neglecting to take the bicarbonate solution they also failed to take sufficient fluids. Afterwards this difficulty was adjusted satisfactorily by giving palatable fluids, such as barley water and lemonade in large quantities, and by giving alkali in small bulk in the form of sodium citrate solution grains xxx to the dose two-hourly.

The following precautionary measures are recommended for patients undergoing intensive treatment in addition to those mentioned in the details of treatment.

- (1) The urine should be tested for albumin before the treatment is begun.
- (2) Large quantities of fluid should be given by mouth in palatable form.
- (3) Some of these men are not used to taking large quantities of fluid and constant supervision is essential to see that they do so.
- (4) Alkali should be given in the form of potassium or sodium citrate grains xxx two-hourly. The value of alkali in preventing renal complications has been questioned and is uncertain. It was decided to continue giving it until further evidence was obtained as to its efficacy ; but certainly it is of less importance than the forcing of fluids. The reaction of the urine should be tested each morning, acidity of the urine being an indication for more energetic use of alkalies. In most of our patients the reaction of the morning urine was neutral.
- (5) The total quantity of urine passed each day by each patient should be measured. Diminution of the amount in a patient known to be taking and retaining large quantities of fluids would be an indication to stop treatment.
- (6) In cases of persistent vomiting fluids should be given by the intravenous drip method if the treatment is to continue.
- (7) The following are indications for stopping the drug : (a) *Hæmaturia*. (b) Severe lumbar pain. (c) Intractable vomiting. (d) Diminished excretion of fluids.
- (8) If anuria supervenes operative treatment as outlined below should not be delayed for more than 12 to 24 hours.

The following is a description of the two cases in which uræmia developed; the early stages of their condition resemble closely those found in the other cases of anuria.

Case 1.—Lance-Corporal M., admitted December 9, 1940, with relapsing non-specific urethritis this being the fourth attack since 1938. On examination a thin mucoid urethral discharge showing leucocytes, secondary organisms and epithelial cells was found. He was given intensive treatment (8, 6, 4, 2, 2, 2, 2, 2, 2 tablets), 16 grams in thirty-six hours. After thirty-six hours he developed hæmaturia and pain in the right loin which required morphia for its relief. The urine contained crystals of acetyl sulphapyridine. Tablets were stopped at once,

but suppression of urine supervened and continued for some days in spite of treatment. During the night of December 15-16 his condition deteriorated rapidly and marked greyish cyanosis, dyspnoea, with sighing respirations, cough and frothy blood-stained discharge from the nose were present. He was unconscious and had epileptiform convulsions. Face and neck were puffy but there was no actual pitting cedema. There were signs of right heart dilation and failure with cedema of the lungs and distended veins in the neck. The blood urea rose from 63 mgm. per 100 c.c. on December 12 to 400 mgm. per 100 c.c. on December 16, the systolic blood-pressure was 180 and the total white cell count rose to 21,200 per c.mm. Marked leucocytosis was a feature of all cases in which renal complications occurred. The following treatment was given :

Continuous oxygen by nasal tube ; lavage of the lower bowel followed by rectal infusion of 30 per cent magnesium sulphate solution ; venesection with withdrawal of 14 oz. of blood followed after two and a half hours by the removal of another pint of blood and intravenous infusion of 4.286 per cent sodium sulphate and 10 per cent glucose in normal saline. That evening (December 16) he began to pass urine and voided 9 pints during the succeeding twelve hours. From this point he made an excellent recovery and on December 21 the blood urea was 35 mgm. per 100 c.c., the patient was normal in appearance and felt well. The urine showed a faint cloud of albumin but there were no pus, blood-cells or casts seen in the centrifuged specimen. On December 28 he was discharged from hospital and returned early in February looking and feeling well, the urine showed no abnormality the blood urea was 34 mgm. per 100 c.c. and the urea concentration test showed normal renal function.

Case 2.—Corporal B., admitted on December 18, 1940, with non-specific urethritis. He was given intensive treatment (8, 6, 4, 2, 2, 2, 2, 2, 2, 2 tablets), 17 grams in forty hours, but after forty hours (December 21) he complained of severe colicky pains in the loins and lower abdomen and the drug was discontinued. Morphia was required to relieve the pain. The patient vomited periodically ; there was no abdominal distension. The total white cell count of the blood was 12,800 per c.mm. rising later to 17,200 (on December 23). During the twenty-four hours that followed several small specimens of urine, heavily stained with blood, and containing crystals of acetyl sulphapyridine, were passed at intervals. On December 22 the blood urea was 73 mgm. per 100 c.c., rising to 94 on the following day and reaching 300 on the day of death. Treatment was given as outlined in the previous case, but without success. He became drowsy with puffy face, sighing respirations, frequent vomiting and fits. He died on December 27.

The pathological findings in this case form the subject of a separate communication by Major N. T. Whitehead, R.A.M.C., to which reference should be made, but the following is a summary of his report and of his suggestions as to the probable sequence of events.

Death in this case was due to the blocking of both ureters by " altered " blood with subsequent anuria and uræmia.

Sulphapyridine crystals were formed in the tubules and were then either forced through the walls of the tubules into the surrounding interstitial tissue or else passed down the tubules into the renal pelvis and thence into the ureters.

Many of those crystals which were side-tracked into the kidney substance damaged adjacent blood capillaries and caused a number of small hæmorrhages. Some of the extravasated blood found its way down the tubules into the ureters.

The crystals which reached the renal pelvis continued their journey down into the bladder but in so doing damaged the walls of the ureters causing subepithelial hæmorrhages. This was particularly so at the ureteral orifices whose lumina were much reduced in consequence.

The narrowed lumina and the sludge-like "altered" blood were held to account for the blockage of the ureters and the fatal consequences.

In the light of after knowledge it is clear that the correct procedure in these cases was to catheterize the ureters and wash out the kidney pelves and ureters in an attempt to clear the obstruction. Unfortunately, we had little knowledge of this complication and its pathology at the time, and this procedure, which might have saved the second patient, was not carried out.

TOXIC EFFECTS IN THE CONTROL GROUP OF 495 CASES TREATED WITH THE ROUTINE FOURTEEN-DAY COURSE OF SULPHAPYRIDINE.

The toxic effects of treatment of this type are now common knowledge, but the details in this group of cases are included for purpose of direct comparison.

Most of these patients suffered to a minor degree from insomnia, anorexia, depression, headache and vague abdominal discomfort. While nausea was the rule, vomiting was unusual and in only three cases was treatment stopped for this reason; in three others who were vomiting, the dose of sulphapyridine had to be reduced. Toxic rashes were the most marked feature occurring in 95 or 19·2 per cent of the cases; these eruptions were of the morbilliform or scarlatiniform type with, rarely, an urticarial element. They were associated with an increase in the severity of the general toxic reactions, frequently with pyrexia and sometimes with a low grade pharyngitis. In 18 of the cases with rashes treatment with sulphapyridine was stopped; in 55 the course was completed with the same doses of sulphanilamide; in the remaining 22 treatment with sulphapyridine was continued to the end of the course. There was one case of hæmaturia and none of agranulocytosis.

COMMENT.

The number of cases is small; the follow up is incomplete and no figures are available for comparison of the end results obtained with the two schemes of dosage. Under these circumstances, no conclusions can be drawn from this investigation; but certain interesting facts emerge. While treating the patients the impression was formed that the intensive method was decidedly superior to other schemes of treatment which had been used. This impression was probably determined by the prompt and clear-cut response to treatment which occurred in the successful cases, and by the fact that the proportion of immediate, group (1), successes was considerably higher in our first 100 cases than in those treated subsequently. In this first 100, 69 were clinically cured after three days of treatment; and our

first "sulphapyridine-fast infection" was not until the 114th case. That this impression was not altogether justified is shown from the figures which run a close parallel in the intensive and non-intensive groups.

The following advantages may be claimed for the intensive method, at any rate as far as the treatment of gonorrhœa is concerned :

- (1) The period of stay in hospital is shortened.
- (2) The unpleasant complications of treatment which commonly occur on or about the ninth day, namely pyrexia, malaise and toxic eruptions, are eliminated for practical purposes.
- (3) The danger of toxic effects upon the bone marrow is less with a three-day course of treatment than with a full fourteen-day course.
- (4) The incidence of "sulphonamide fastness" and of urethral infiltrations was markedly diminished. In preventing these the addition of urethral irrigations to the routine fourteen-day course would in all probability be equally effective.
- (5) The treatment is more economical in that fewer tablets are required and in-patient treatment is curtailed.

Attention is drawn to the following disadvantages :

- (1) During the short period of treatment many patients vomited a great deal and felt unwell ; on the other hand in many cases the malaise was no worse than is commonly experienced with routine non-intensive dosage. Those patients who had experience of both were questioned and all stated that they preferred the intensive treatment owing to its short duration.
- (2) Renal complications were more common. No doubt the incidence in this series was exceptionally high and it is believed that with the help of present experience it would be possible to avoid the more serious effects of these complications.
- (3) The treatment is not practicable under out-patient conditions.

In view of the fact that we were inexperienced with the method and deliberately prolonged observation and in-patient stay in these cases, it may be that the scales of this investigation are to a certain extent weighted against the intensive method and that, with the help of experience gained, better results could be obtained and the period of treatment shortened in those patients who do not immediately respond to the three-day course.

The proportion of immediate successes in patients with gonorrhœa in both intensive and non-intensive groups is less than that which has been claimed in the large majority of publications on the subject, although the totals shown by the combination of groups (1) and (2) are not far short of the percentages of success which are claimed by most workers who have used sulphapyridine without irrigations. We attribute the difference to the routine tests involving the examination of the morning smear and the all-night urine during the period of observation. In previous work in civil clinics it was not possible to apply these tests as a routine and it is believed that some latent infections escaped notice and further treatment in consequence.

SUMMARY.

(1) 502 patients, including 397 who were suffering from gonorrhœa and 98 who were suffering from non-specific urethritis, were treated with a three-day course of intensive treatment with sulphapyridine, along the lines first suggested by the Aberdeen school.

(2) Of the patients with gonorrhœa 49 per cent required no further treatment and remained in hospital an average period of thirteen days; 15 per cent required a small amount of extra treatment and remained in hospital an average period of twenty-three days, and 36 per cent required considerably more treatment with an average in-patient stay of forty-four days.

(3) Of the patients with non-specific urethritis 28 per cent required only the initial course and the average length of stay in hospital was thirteen days; 7 per cent required slightly more treatment, remaining in hospital an average of twenty-three days, and 65 per cent had considerably more treatment, the in-patient stay amounting to an average of forty-eight days.

(4) A comparison with the same number of cases treated non-intensively with a fourteen-day course of treatment showed that in the two groups there was little difference in the proportion of successes, although in-patient stay was shortened for patients treated successfully with intensive dosage.

(5) The complications of the treatment consisted of minor toxic effects, of which vomiting was the most frequent and troublesome, and of toxic effects on the kidney due to excretion of crystals of the acetyl derivative of sulphapyridine. In consequence there were two cases of hæmaturia, two of severe lumbar pain, and five cases of anuria, in two of which uræmia developed, one terminating fatally. Methods of avoiding or minimizing these complications are discussed.

We wish to thank Colonel H. L. Howell, *O.B.E.*, *M.C.*, Commanding Royal Victoria Hospital, Netley, for permission to publish the result of this investigation, Lieutenant-Colonel T. E. Osmond, *R.A.M.C.*, for helpful advice, Dr. Robert Forgan for his kindness in undertaking the very considerable task of abstracting the literature on renal complications and Major J. S. Sloper, *R.A.M.C.*, Medical Specialist to the Royal Victoria Hospital, for permission to use his clinical notes on the later stages of the two cases described in detail.

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SOME FIELD AMBULANCE NOTES.

BY LIEUTENANT-COLONEL T. A. BUTCHER, *O.B.E.*,*Royal Army Medical Corps.*

DURING the eight months that the Field Ambulance to which the author was attached was in France and Belgium it was sometimes found necessary to use improvisations and unorthodox methods. Some of these were found sufficiently good to be used later as a routine and they are here described in the hope that others may find them of value.

(1) *Portable Shelter*.—This was designed for use in an area inaccessible to motor transport and was used more than once under these conditions. It is possible that it might be found of even greater value by regimental medical officers.

The shelter consisted of a tarpaulin thrown over three iron hoops which were bolted together by two iron rods which formed a ridgepole (figs. 1 to 3).

Additional security was given by two guys at each of the four corners. The ends of the tarpaulin were pegged down. Each end of the shelter was closed by two rot-proof canvas strips overlapping in the centre to allow entrance. The whole was rendered completely light-proof by a canvas "frill" sewn on to the edges of the tarpaulin and overlapping the rotproof canvas curtains at the ends of the shelter.

Dimensions.—Length 14 feet 6 inches. Breadth 9 feet. Height 6 feet. The weight of the iron hoops and rods was 70 pounds, but would be much less if made of tubular metal.

The metal portions, when taken to pieces, occupied very little space in a lorry and could be carried on one stretcher.

The tarpaulin, rolled, was also easily carried on a stretcher.

The shelter was simple to put up or take down. A trained squad was able to erect it in one and a half minutes.

It normally took two stretchers placed longitudinally but could accommodate nine men lying crosswise on groundsheets.

(2) *Portable Drying Room*.—The shelter described above could also be used as a drying room.

Hot air from the end of a field cooker (petrol) was led under the canvas at one end of the shelter. In order to avoid scorching the canvas, the end of the petrol cooker was inserted into a tunnel made out of petrol tins covered with asbestos sheeting and passing under the canvas. The opposite end of the shelter was closed with rot-proof canvas except for 6 inches at the top to allow the escape of hot air. Clothes to be dried were hung on strings running from side to side across the shelter.

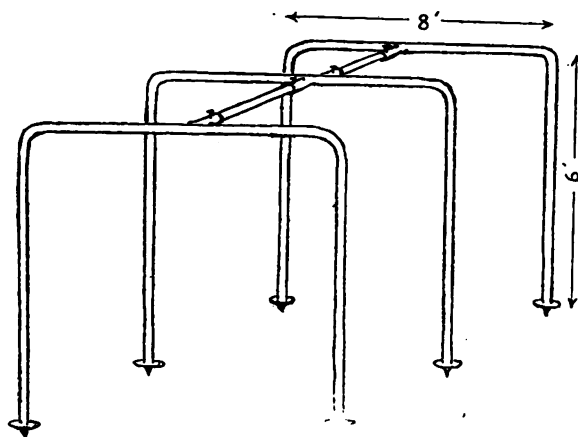


FIG. 1.—Metal frame of shelter.

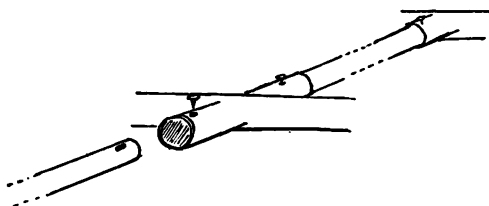


FIG. 2.—Detail of joints of ridge pole.

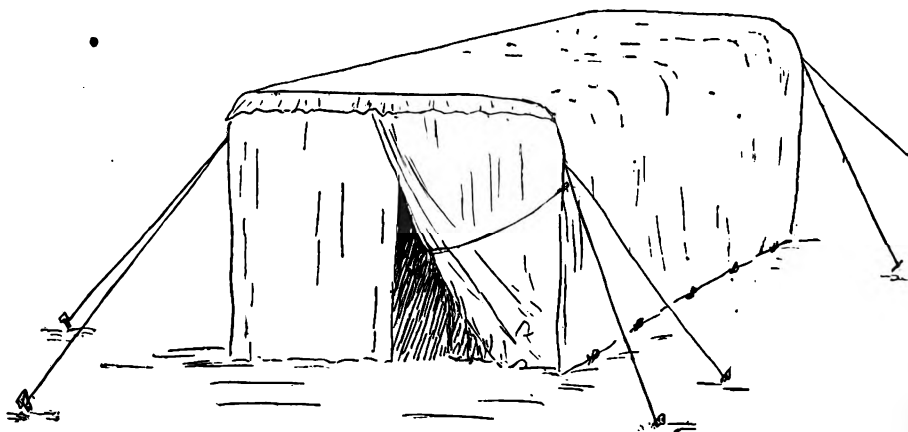


FIG. 3.—Shelter erected.

No extensive trial was made of this method which was devised only a few days before the advance into Belgium.

(3) "*Spat*" *Extension for Fractured Femur*.—In cases of fractured femur in which it was found necessary to remove the boot a spat was buttoned on to the ankle and extension applied, on the outer side to the buckle of the spat, on the inner side to the strap which was sewn back on itself to form a loop (fig. 4).

This method should be of value in dealing with a case where the boot has become contaminated with mustard gas.

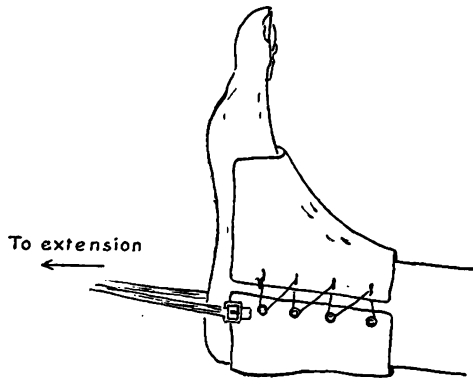


FIG. 4.—"Spat extension" for fractured femur.

(4) *Illuminated Serial Number for Night Convoy Work*.—When travelling in convoy at night, without side or tail lights, and using only the small white light fixed under the tail of the lorry and shining on the differential, it was often very difficult to be certain that one was following the correct convoy. To avoid this, a piece of sheet metal 8 inches square, painted white with the serial number in black, was fixed in metal guides on a wooden block bolted to the bottom of the lorry in such a position that the light shone on it.

The number could be easily read at 40 yards.

The detachable metal sheet was used so that it could be removed and cleaned after a journey.

The ambulance cars were dealt with similarly, except that the black serial number on a white background was painted on the rear cross-member.

(5) *Use of slings*, for hand-carriage of stretcher by four bearers.

When moving over very rough ground, especially at night, the shoulder-carry is liable to be dangerous.

In such cases the hand-carriage over long distances may be made much easier by the use of four stretcher-slings.

Each of the four bearers passes one end of his sling through the opposite loop. The large loop thus formed is passed round the chest and over the shoulder furthest from the stretcher.

The loop on the free end is passed over one stretcher handle and the length of the sling is adjusted so as to take most of the weight on the shoulder (fig. 5).

I am indebted to Captain G. N. Wood, R.A.M.C., for this idea.

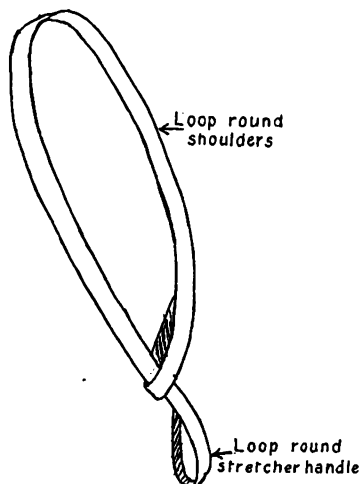


FIG. 5.—Sling adjusted for hand-carriage of stretcher by four bearers.

(6) *Alteration in Loading List for Company Lorries (30 cwt.).*—No. 1 lorry was loaded according to the list appended. This contained everything necessary for the establishment of an advanced aid post ("light section") and so could be sent out at short notice. The remainder of the Company equipment was distributed between the remaining three lorries.

The N.C.O. in charge of each lorry had a list of the contents of his lorry. On this list items that were operationally vital were marked with a red cross.

In the case of a lorry becoming disabled, it was easy for the N.C.O. to pick out and transfer to a rescue lorry the items marked in red and, if necessary, room could be made in the rescue lorry by throwing out the less important of its contents, i.e. those items not marked with a red cross.

LOADING LIST.—"A" COMPANY.

LORRY 1. LOADED AS FOR A.A.P.

F.A.P. No. 2	..	..	..	..	..	1
Flags, directing with pole	..	..	..	..	..	1
Splints Thomas' complete	..	..	..	..	..	2
Bars suspension	..	..	..	..	..	2
Stretchers with pillows	..	..	..	..	..	18*
Shovels G.S.	..	..	..	..	..	1
Sheets ground	..	..	..	..	..	15
Medical Comforts Pannier	..	..	..	..	..	1

Blankets	40
Brushes sweeping	1†
Containers water 2 gallon	2
Containers kerosene 2 gallon	1
Containers food 1 gallon	1
Cramer's wire pieces	5
Lamps hurricane	1
Tins roasting large	1†
Tins roasting small	2†
Pails galvanized.. .. .	1†
Axes pick	1
Signs A.A.P.	1
G.S. Pannier	1
Contents :	
Suits pyjamas	10
Hooks reaping	1
Scissors Stretcher Bearers'	6
Slings Stretcher Bearers'	16
Screwdriver	1
Stoves wickless	1
Repair outfits	1
Carbide	lb. 6
Lamps acetylene	1
Lamps oil wall	1†
Pannikins	6
Pincers carpenters'	1
Pliers side-cutting	1
Towels Terry	3
Teapots enamel	1
Warmers stomach with covers	3
Brushes scrubbing.. .. .	1
Kettles enamel	1
Axes hand	1
<hr/>	
Ointment A.G. .. .. .	.. jars 20
Eyeshields boxes of 6	boxes 10
Haversacks surgical	2
Haversacks shell dressing	3
Shell dressing spare	10
Bottles water medical	4
Individual detectors	100
Detectors gas ground .. .. .	.. Bks. 5
Detectors gas spray .. .. .	.. Bks. 8
Detectors gas spray holders for	6
Boots anti-gas .. .. .	.. pr. 8
Trousers A.G. .. .. .	.. pr. 3
Pouches	5
Signs warning gas	4
Capes A.G.	10
Gloves A.G. .. .. .	.. pr. 10
Bleaching powder .. .. .	.. lb. 28
Bags contaminated	3

* Includes additional issued and not included on G.1098.

† Indicates items purchased privately.

This lorry is loaded as an A.A.P. with some arrangements to enable the staff to cook.

RANDOM NOTES IN FIELD AMBULANCE TRAINING.

BY LIEUTENANT-COLONEL N. J. GIBSON,

Royal Army Medical Corps.

THE first principle in the training of Field Ambulance personnel as in all other arms of the Service is the inculcation of discipline. It is the basis and the only basis of success. Without it as a foundation technical training is to a large extent a waste of time. But it must be taught, not only enforced. It can be fostered by teaching *esprit de corps* and a high sense of duty, example being the best teacher of all. The kind of discipline which stands best when a testing time comes is that which rests on the mutual respect and affection of the man and his officer but officers have to earn this respect. Among other things they must adopt the principle always of seeing their men are looked after before thinking of themselves and their own comfort. Men will always do their best work when they realize they are being looked after as well as circumstances allow.

Drill is essential—foot, stretcher, saluting and marching. Its importance must be realized and it must not be sacrificed to technical training. Routine P.T. for all ranks should be the rule.

Despite mechanization ability to march is essential. Route marching should be assiduously practised by graduated stages, the standard to be finally attained being 25 miles a day.

During the training period especially a medical officer will realize that to be an efficient R.A.M.C. officer he must have a good knowledge not only of technical subjects but also of many purely military matters.

Officers should have drill and P.T. as for other ranks, so that they may be capable of supervising it apart from its value in producing smartness in themselves. Instruction should be given in orderly room and pay duties and they should learn from the Quartermaster how medical and ordnance stores are indented for, the use of issue and receipt vouchers, how to check stores and draw supplies. Generally they should have a sound knowledge of all R.A.M.C. duties as they apply to other ranks.

They should be able to handle motor cars, lorries, ambulances and motor bicycles and some instruction should be given by the R.A.S.C. officer attached on the mechanism of I.C. engines. Efficient evacuation depends on efficient transport and the R.A.S.C. officer may not always be available to handle breakdowns on service.

Instruction should be given in map reading and compass work. They should know the tactical dispositions and something about the handling of the other arms of the Service within the Division and understand the relation of the Medical Services to each. T.E.W.T.s are the best way of teaching this and also the tactical handling of the Field Ambulance itself.

While knowing something about everything it is considered that each medical officer should have a speciality and know as thoroughly as possible a particular aspect of Field Ambulance work. Officers should be selected according to their suitability for a certain branch of the work—surgery—medicine—bearer work—gas—adjutant.

The training of the R.A.M.C. personnel in technical duties should be done by these specialists, preferably by the officers under whom they will work. A point that occurs here is that nursing orderlies in Military Hospitals are trained by the Nursing Sisters and in their absence these duties will require to be taught by a medical officer. Not all medical officers have a knowledge of sick nursing !

It is considered that the three important things to be taught to nursing orderlies and stretcher bearers are first aid treatment of fractures, the arrest of hæmorrhage and the treatment of surgical shock. They should be thoroughly grounded in these and not over-burdened with detail. A man can be taught to splint efficiently a fractured limb even though he may not know the name of the broken bone. Stretcher bearers particularly must be thoroughly drilled in the putting on of the Thomas' splint till they can do it automatically even in the dark.

Bearer officers should teach the stretcher bearers, thereby getting to know them individually, and they must make a special study of the problems they have to face bearing in mind that much of their work may have to be done in the dark. They should learn how far men can carry loaded stretchers and for how long without relief, how to arrange reliefs, the positioning of bearer posts and car posts and the handling of communications, a point of the very greatest importance..

Thorough training of the stretcher squads is essential and always repays the time spent. They must be highly disciplined, resourceful, have initiative and be encouraged to use it. Their work is arduous and dangerous, they are much on their own, often in the dark, and their sense of duty must be high. N.C.O.s especially must be selected for this latter quality and they must have "guts." A good bearer N.C.O. is beyond price.

Stretcher bearers, in fact all personnel, should know how to handle tools—picks, shovels, etc.—and digging should be practised so that men may learn to throw up shelters quickly for themselves, say at a bearer post, apart from the digging of latrines, etc. Officers should know roughly how long it takes and how many men are required to complete these ordinary tasks so necessary in the Field.

The problem of gas casualties must be thought out and a scheme prepared for their handling. The question arises here whether a special small group of personnel with intensive training might not be more efficient for the purpose than the whole of the Field Ambulance personnel half trained. This group would form the trained personnel for the gas section of the A.D.S. or M.D.S. when required. Two medical officers would be responsible for the training of themselves and this group.

When equipment is issued all ranks must be taught the loading of stores in their appropriate transport and, the best way having been found by experiment, it must be regarded as standard and not departed from. Speed of loading is to be insisted on and this can be attained only by constant practice till the process of loading and unloading is automatic and mechanical as far as possible. "A place for everything," is the rule and the individual panniers should be handled similarly.

It must never be lost sight of that the Field Ambulance is a mobile unit and that it must keep pace with infantry. Unless the twenty-one tons of medical and ordnance stores are handled intelligently and on a cast iron system confusion and delay are inevitable. A word here might be said regarding the gathering of non-essentials, the extras picked up when the unit is stationary for any length of time. This habit must be guarded against. It is fatal to mobility. Transport is provided only according to the weight of War Establishment stores and if extras have to be carried—and the temptation to carry them is great—lorries become overloaded and inevitable breakdown troubles occur.

If canteens are run for personnel, and they ought to be wherever possible, they are, unless carefully watched, a ready source for the collection of rubbish. Canteens must always be under the supervision of an officer who should be responsible for all monies and the payment of bills, keeping of books, etc.

Nothing particular has been said about the knowledge of hygiene and sanitation necessary for all ranks as this appears self-evident but it is considered that the Field Ambulances in this respect should be a model for all the units in the Division to follow.

The contribution to morale generally which can be made by the Medical Services of a Division being efficient, and looking it, cannot be over-estimated.

It is hoped that these few and rather sketchy notes may be of some help to the many young doctors now joining the R.A.M.C. and who may be so fortunate as to find themselves in a Field Ambulance. The doctoring they get to do will come by fits and starts but much more than merely professional capacity will be required of them. In war to be efficient doctors they must be efficient soldiers.

The first quality is assumed, the second has definitely to be learned.



Editorial.

REPORT OF THE GOVERNING BODY OF THE LISTER INSTITUTE, 1941.

THOUGH greatly depleted by the transfer of many members of the Staff to war work the Governing Body of the Lister Institute continues to publish its Report as usual and to make just as many contributions to science as it has done year after year in the past. The main building at Chelsea has suffered, being damaged by the fall of bombs in September, 1940, and again in April, 1941, but the Biochemical and Biophysics laboratories are still there and a large number of members of the Institute Staff have arranged to carry on their work at Oxford, Cambridge and the East Malling Research Station at Maidstone where facilities have been made available.

The research work produced by these members is of a very high order and we think it well to mention some of the more valuable portions of the Governing Body's Report though considerations of space forbid anything but a brief review.

Dr. Muriel Robertson, so well known for her work on the anaerobes of wounds during the last war, has been engaged with Mr. Keppie in a study into the toxicity for mice of strains of *Cl. welchii* from war wounds and air-raid casualties and in a comparison with the clinical features noted in the cases from which the strains had been isolated. "By observing the pH values of the medium at three to four hours, a period coinciding with the peak of fermentation, and again at six to seven hours when toxin production had reached its height, it became evident that strains produced their best toxins at certain pH values. A pH value of 6 to 6.2 at four hours, with a slight movement towards the alkaline side at six to seven hours, was nearly always the successful cycle." The work proves that "while there is little doubt that the more toxic strains are likely to exert a more harmful effect upon the resistance of the patient than the less toxic, it is equally clear that even the less toxic are capable of setting up gas gangrene."

An investigation into the so-called entero- and neuro-toxins of *Bact. dysenteriae* (Shiga) started by Dr. D. W. Henderson and continued by Dr. Steabben has determined the prophylactic values of the corresponding sera against the test infection of mice with the living organisms. The anti-bacterial serum was prepared by immunization with five hours old smooth cultures which appeared to be free from the characteristic Shiga toxin. The antitoxic serum was obtained by immunization with toxic filtrates of the "rough" variant of the same strain and contained 500 units of anti-toxin per c.c. "The antibacterial serum was found to possess high protective value against known infective doses of living bacilli while the anti-toxic serum had no such property." This observation may prove of great utility in the preparation of serum for use in dysentery.

Experiments on antityphoid vaccine have been continued by Dr. Felix who claims that a new type of vaccine with more extensive immunizing properties than the old has now been produced. He considers that the main point is to retain the Vi antibody in its full opsonizing and protecting power. "When a vaccine is stored in the cold, in saline alone, or with the addition of 0.5 per cent phenol or 0.35 per cent tri-cresol, an alcohol-killed vaccine loses almost entirely its capacity of stimulating formation of Vi antibody in the rabbit though O antibody is invariably produced in high titre. It is now found that a vaccine that is not only killed with alcohol but preserved in it still contains the Vi antigen in its effective form after storage in the cold for at least nine months and probably much longer." This will, doubtless, prove to be true. The new vaccine appears to have been found effective in certain tests in the Navy and the Air Force. On the other hand, we know that the vaccine produced by the Royal Army Medical Corps has a high immunizing value and it would seem precipitate to change it for one containing so much alcohol at this time when supplies are short if, as seems likely, the advantages to be gained are relatively slight. The matter, we think, should still remain under consideration. In the meantime, we wish Dr. Felix every success with his vaccine and hope that it may prove as good as he hopes.

Substances that increase tissue permeability receive consideration as also endocrinology, the accessory food factors, the sensitizing action to light of buckwheat and Vitamin C. Under "Endocrinology" there is an interesting report on the nutritive value of yeast. Four samples of *Torula utilis* grown on a molasses medium and roller dried, freeze dried, vacuum dried and spray dried all contained about 60 μ g. riboflavin and 50 μ g. vitamin B₆ per gram dry weight and also equal amounts of filtrate factor complex. "The method of drying had apparently no effect on the B₂ vitamins of the yeast." As an experiment, Dr. Chick has studied the supplementary value of the B vitamins of *Torula utilis* for those in straight run white flour. "The addition of 5 per cent yeast to white flour made it a better source of B vitamins than wholemeal flour, while the addition of 2½ per cent made white flour approximately equal to wholemeal flour as regards B vitamins." Both casein and yeast protein had striking supplementary effects when fed to pigs adequately supplied with all other nutrients but having maize as the sole source of protein. At all levels of protein fed the animals given yeast thrived just as well as those given casein. "As a supplement for the biologically poor proteins of maize, yeast protein is equal to casein, a first-class animal protein." There are so many things that might be mentioned that we tend to forget the space afforded for a notice of this very valuable report. Tomatoes, we see, grown in the open, are markedly more potent as a source of vitamin C than those grown under glass; and we learn that strawberries are as good as citrus fruits in this respect. We lay the report down reluctantly and commend the original to all who may be in need of information on matters intimately connected with our daily lives.

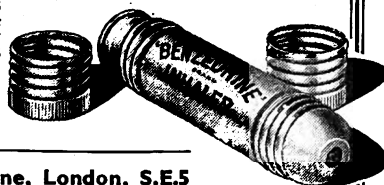
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Clinical and other Notes.

THE SILVER NITRATE TREATMENT OF IMPETIGO CONTAGIOSA.

BY CAPTAIN V. J. DOWNIE,
Royal Army Medical Corps.

THE following account of a method of treating impetigo may be of interest in view of the distressing features of this disease and its tendency to spread amongst troops and other communities.

It is a frequent and disappointing feature of the usual treatment of impetigo by unguents that extension of the disease is seldom arrested by the first few applications. Indeed it often seems to be accelerated.

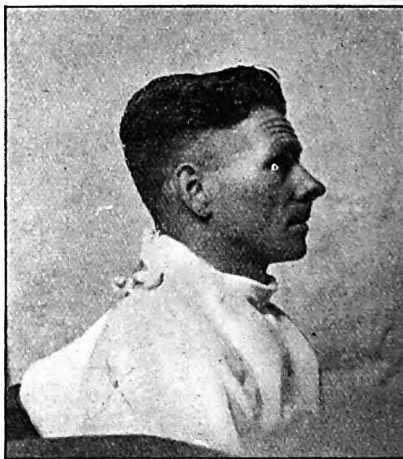
It would appear that the exudate from the sores is the infective agent and that spread occurs via the copious initial flow after removal of the crusts and from seepage over the skin underneath the dressings.

Exclusion of air seems to have a retarding effect on the progress of the disease, which rationalizes the occlusive treatment of impetigo by Elastoplast and may explain the relative avirulence of the disease on the legs as compared with its rapid extension on exposed areas such as the face. It is noticeable that ointments are more effective when well covered with lint than when simply smeared over the lesion.

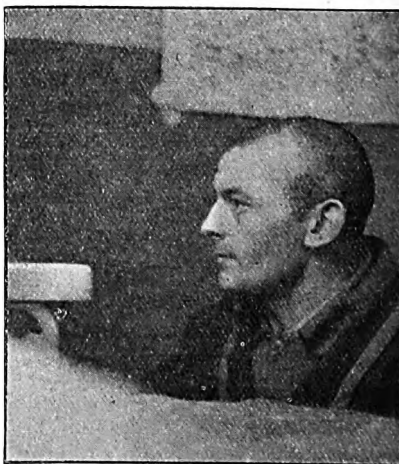
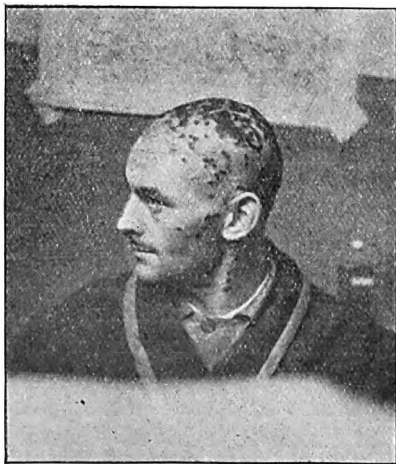
The principles of the treatment described below are threefold. Firstly, control of exudate and therefore of spread by immediate coagulation of the raw surface which follows removal of the crust. Secondly, exclusion of air by a firm impervious coagulum and, lastly, sterilization of the affected area by powerful caustic action.

The details of the method are as follows: the crusts are gently but *completely* rolled off by prising up a corner with the edge of a pair of fine forceps of the "splinter" type. The raw surface left should be evenly pink in colour: bleeding should be regarded as a result of faulty technique and imperils the success of the method. It should be emphasized that this is not, or should not be, a painful process and that starch poultices or soaking of the scabs are not necessary and only result in contaminating the surrounding skin. As soon as each individual scab is removed the raw area is firmly "blotted" with a small swab wrung out of ether-methylated spirit and gently but thoroughly rubbed with a silver nitrate stick, the application extending just over the margin of the lesion. A greyish-white coagulum forms immediately and subsequently turns black. If the stick is not applied as soon as the raw surface is exposed, exudate oozes on to and infects the surrounding skin. When all the lesions have been treated in this manner all unaffected skin on the face and neck is thoroughly rubbed with

methyated spirit with the object of disinfecting any areas which have been accidentally contaminated during treatment.



Case I.—This is an example of the early type of case in which the arrest of spread is most noticeable and gratifying. The patient is a nursing orderly who contracted the disease whilst treating another patient, and the left hand photograph was taken on the day following application of the silver nitrate. The photograph on the right shows the same patient after six days. There has been no spread and cure is complete. There was an isolated lesion on the scalp which responded in a similar fashion.



Case II.—When first seen this man's scalp was almost entirely covered with impetigo and the hair thickly matted with discharge. The photograph on the right shows the condition on the twenty-seventh day when the cure was practically complete.

No further dressing is required and the patient is seen on the following day and then at intervals of three days to ensure that no fresh lesions have appeared. Occasionally there is very limited extension at the edge of a

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coagulated area and these little crusts should be rolled off and the area touched up with the nitrate stick. The coagulum should be closely adherent and almost level with the skin surface or even slightly depressed. The characteristic irritation of the disease is completely relieved within 24 to 48 hours by a successful application.

On the same day that the treatment is started the man's razor is dismantled, washed and sterilized together with his shaving brush in an antiseptic lotion. He is instructed to replace his towel and bolster case (or its equivalent) by clean articles. If the forehead or scalp is affected, the F.S. cap should be steam disinfected. The S.D. cap cannot be treated in this way but the leather hat band can be cleaned with an antiseptic lotion. Washing and shaving near the affected part are not permitted but the beard may be clipped short with scissors.

This treatment should be carried out by a medical officer or by a skilled and conscientious nurse or nursing orderly. Careless or unthorough application of the method neglects the underlying principle of prevention of spread and invalidates the whole treatment.

The advantages of the method are several. It costs practically nothing as compared with the not inconsiderable expense of frequent and often copious dressings for days or weeks. Frequent attendance is not necessary and loss of duty is consequently minimized.

The only disadvantage is that application of the silver nitrate is rather painful if the lesions are at all extensive. However, it is submitted that a single painful dressing is infinitely preferable to the daily and prolonged discomfort of other methods.

It is contra-indicated when ointments have been used previously and in those cases where secondary infection has supervened and removal of the scab reveals a purulent surface. The coagulum is lifted off and softened by the pus and the object of the treatment is defeated.

It is most effective in the early case where only one or two scabs have developed. The rapid cure and complete absence of spread is most gratifying, as the writer can testify from personal experience as a patient.

I am indebted to Corporal Upton, R.A.M.C., for his conscientious treatment of all patients.

AN IMPROVEMENT FOR THE "STRETCHER SPLINT."

BY LIEUTENANT-COLONEL (ACTING COLONEL) J. BRYAN FOTHERINGHAM,
Royal Army Medical Corps.

IN a training article published in March 1939 [1] I gave a full description of the use of the "Stretcher Splint" and suggested that "If rough ground has to be traversed, then a broad bandage can be placed round the stretcher and patient at the level of his hips and securely tied."

By using a blanket and a few safety pins one can get much more support for the patient than with any type of broad bandage generally available.

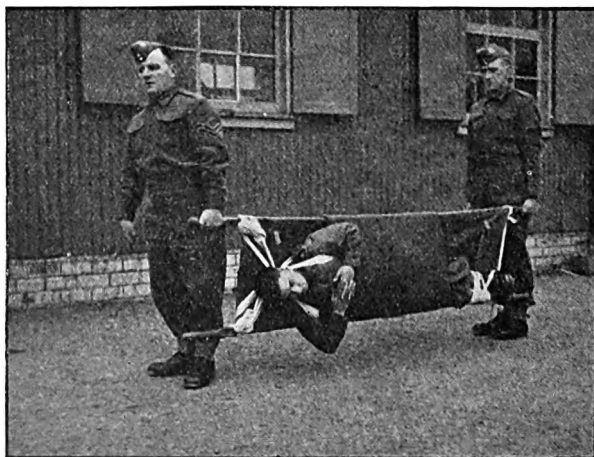
The method is very simple and requires two bearers. Although it may be known to many people, I only discovered it accidentally. The steps are as follows :

(1) A blanket is folded in half lengthways, passed under the stretcher, then over the patient with some 3 inches of blanket edge tucked under the stretcher pole on the injured side, i.e. the same side as the fractured femur.

(2) One bearer holds this edge of the blanket under the stretcher and the other bearer pulls the remainder of the blanket as taut as he possibly can.

(3) The blanket is then carried across the patient for the second time, pulled as taut as possible, and the free edge of the blanket fastened beneath the stretcher to the original fold of blanket by means of six safety pins inserted at regular intervals.

Care should be taken to keep the blanket taut throughout the whole movement. It facilitates the insertion of the safety pins if the side of the stretcher is raised from the ground. As the safety pins are on the opposite side to the injured leg, this raising of one side of the stretcher a few inches off the ground does not tend to cause any movement of the fractured limb.



When moving a patient in the position as shown in the photograph always turn the stretcher towards the injured side. If done the reverse way there is a tendency for the injured limb to move. The upper edge of the folded blanket should be immediately below the patient's costal margin to avoid pressure on the chest.

A combination of the "Stretcher Splint" method, modified if necessary, and this simple use of a blanket with a few safety pins has somewhat similar uses to the "Universal Stretcher Sheet" [2]. Apart from fractured femurs

patients with abdominal or chest wounds, etc., could be first aided for transport through narrow doors, along narrow trenches, through windows, up or down ladders and in many places where it would be impossible to use a stretcher in the orthodox way.

I am indebted to Major J. Howell, R.A.M.C., for the photograph.

REFERENCES.

- [1] FOTHERINGHAM, J. B. *Journal of the Royal Army Medical Corps*, March, 1939.
- [2] R.A.M.C. Training, 1935, para. 449.

A SIMPLE METHOD FOR THE CONVERSION OF 3-TON AND 30-CWT. LORRIES FOR CARRYING STRETCHERS.

BY LIEUTENANT-COLONEL A. L. CROCKFORD, *M.C.*,
Royal Army Medical Corps.

I.—FITTING THE LORRY.

A. Eight lengths of two-inch manilla rope are hung from the iron framework carrying the hood, four each side, to hold the four handles of two stretchers. Each length is spliced with a loop at both ends; one is for the stretcher handle and the other to encircle the bar of the framework and so prevent removal. Total length of each piece with the two loops—21 inches. Total length required per lorry—36 feet.

B. To prevent side sway four lengths of one-inch rope are used, one for each end of the two stretchers. These are spliced with a loop round the two outer longitudinal bars of the hood frame; the free end has a slip noose made with a small wooden toggle. This is passed over and under the inner handle through the inner runner and the noose looped over the outer handle. The noose is then tightened with the toggle. The stretcher is thus firmly laced into the side. Total length required per lorry—30 feet.

II.—LOADING AND UNLOADING.

A. 3-ton lorry—the stretcher is placed on the floor of the lorry, Nos. 1 and 2 getting into the lorry first. Nos. 3 and 4 then follow; the patient is lifted up and the loops slipped on the stretcher handles. The side ropes are then made fast. Unloading is merely a reverse of this procedure.

B. 30-cwt. lorry—here owing to lack of length of the floor of the lorry the driver should fix the tail board horizontal to the ground when the stretcher and squad are inside. This allows Nos. 3 and 4 room to step back when raising the stretcher.

III.—GENERAL POINTS.

This is a simple, cheap, and effective method of carrying two stretchers, leaving the floor free for sitting cases or two more stretchers. The slight degree of freedom of fore and aft movement adds much to the comfort of

the patient. It was devised only for emergency work over short distances. The ropes are all spliced in so they cannot be easily removed ; at the same time they in no way interfere with the ordinary use of the lorry.

THE McCUSKER TRACTION FOOTPIECE AND SUPPORT FOR USE WITH THE THOMAS' LEG SPLINT.

BY COLONEL E. A. McCUSKER, *M.C.*,
A.D.M.S. 1st Canadian Division.

FOREWORD BY COLONEL J. M. WEDDELL, *F.R.C.S., K.H.S., Consulting Surgeon.*

As described in the following note the traction footpiece and support for use with the Thomas' knee splint in first-aid work and transport of lower limb fractures has been devised by Colonel E. A. McCusker, *M.C.*, *A.D.M.S. 1st Canadian Division.* By eliminating several loose pieces of equipment, simplifying the application, and enabling the patient and splint to be moved as one unit, it is hoped that a very definite improvement will have been made.

The footpiece is being tried out practically and if it turns out to be satisfactory will be adopted for use.

For some time it has been evident to the writer that a simpler method of applying the Thomas' splint must be devised in order to obtain the maximum benefit from its use.

Listed below are difficulties encountered in the ordinary method of application :

(a) Many bandages are required to make a trough in which to support the fractured leg. These require adjusting which is difficult in the dark, and they require so much handling that cleanliness is impossible.

(b) The clove hitch presents difficulties to the inexperienced and interferes with circulation.

(c) The caliper is not satisfactory, nor is the skewer.

(d) A short piece of wood or metal must be carried for a windlass to obtain traction.

(e) The reversible stirrup (Sinclair) must be carried. It is not steady and a bandage must be used to anchor the foot to it.

(f) Suspension cannot be obtained until the patient is placed on the stretcher. The suspension bar is then put in place and bandages must be used to suspend and anchor the splint.

(g) The patient cannot be removed from stretcher without removing the suspension bar.

(h) The suspension bar interferes with placing stretcher cases in ambulances.

In addition to the above, this procedure is wasteful of time and material.

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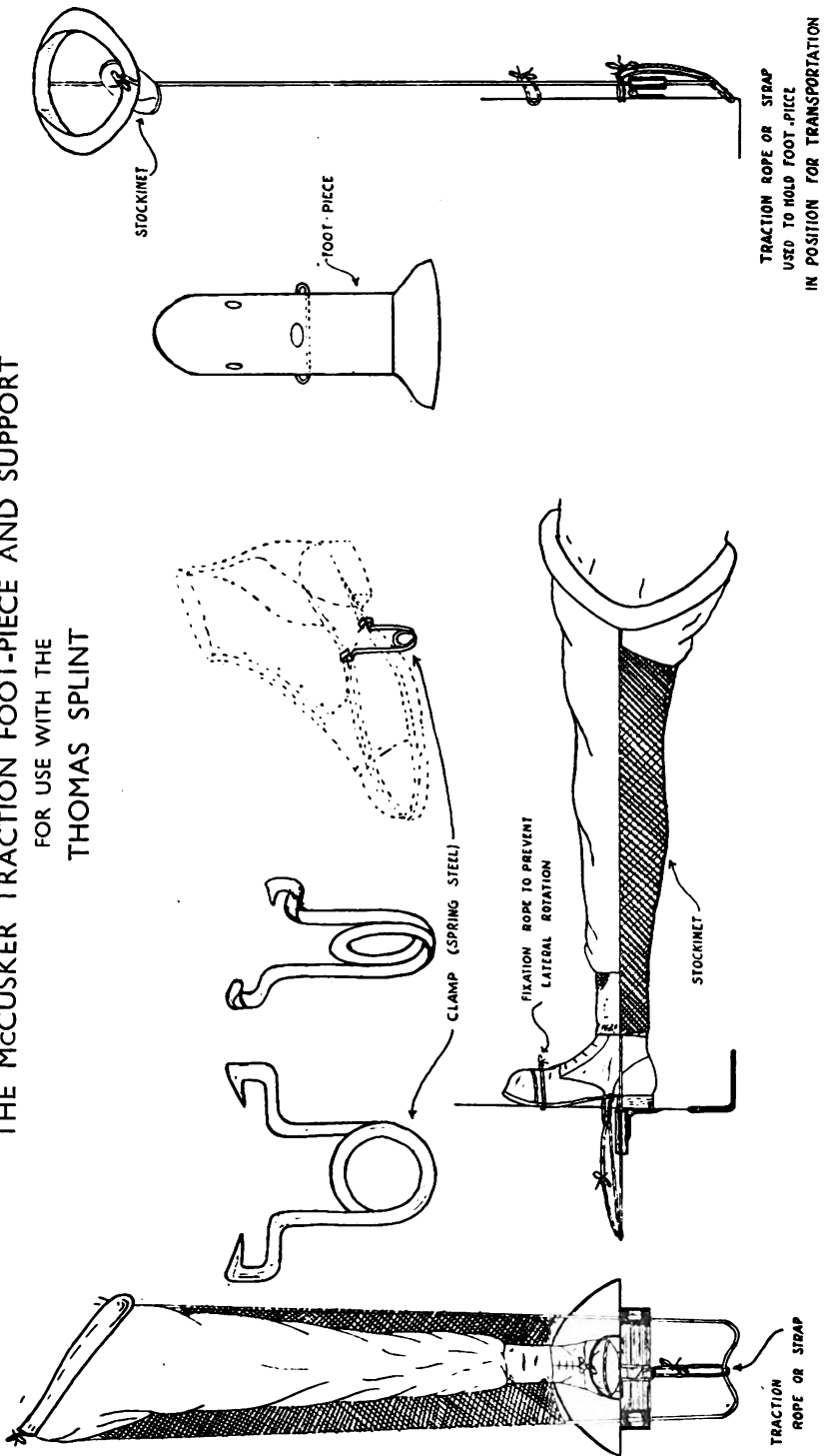
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TO SIMPLIFY THIS TECHNIQUE IT IS SUGGESTED THAT :

(a) A stockinet be slipped over the Thomas' splint to form the supporting trough. This can be sterilized and carried in the waterproof case attached to the splint. It requires little handling and can be put on in the dark. It can be washed several times and decontaminated if exposed to gas. It is inexpensive. (If surgical stockinet is not available the leg of a pair of under pants serves admirably.)

(b) The combined traction footpiece and support which can now be slipped on takes the place of all other equipment in that :

(1) The spring instep clamp which grasps the waist of the shoe just anterior to the heel passes through the oval aperture in the centre of the footplate. The toe is fixed to prevent lateral rotation.

(2) Traction is obtained and maintained by a rope or strap from the spring instep clamp to the notch in the end of the splint.

(3) From the heel of the footplate a bar of light iron extends downward 2 inches then bends at right angles towards the body to rest on the ground, or on the stretcher, and takes the place of the suspension bar.

(4) The patient can be moved readily to and from stretcher.

(5) The toe piece extends high enough to carry weight of blankets.

(6) The footplate is attached to a hinged crossbar which is turned at each end to fold around the parallel bars of the splint, on which it can slide to the desired position but which prevents any lateral or rotary movement. When not in use, the footpiece folds through 90° to lie parallel to the bars of the splint. It is tied in this position and cannot be lost.

Advantages are :

(1) Simplicity, economy, lightness and mobility.

(2) Highly trained personnel are not required for rapid and satisfactory application.

Current Literature.

STOCKS, P. **Morbidity and Death-Rates in the Great Towns.** *Lancet*. 1940, Nov. 2, 550-53, 1 chart.

This report compares the trends of quarterly mortality rates up to the end of June, 1940, from all causes of death and from diphtheria, measles, whooping-cough, and cerebrospinal fever in groups of the great towns classified as evacuation, neutral and reception areas. Notifications of the infectious diseases are similarly examined. In those towns which served as reception areas there was initially a relative rise in total mortality, due probably to the transfer of an undue proportion of infirm persons from the evacuation towns. Subsequently their position improved. During autumn



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and winter when schools were closed in evacuation areas and partly closed in neutral areas, the diphtheria notification rates among children in London and the evacuation towns were only half those of a year previously, compared with falls of 17 and 22 per cent in the reception and neutral towns. There was, however, no equivalent reduction in the death-rate. In the June quarter, when schools reopened, the contrast between evacuation and reception towns disappeared. Scarlet fever likewise showed a greater fall in the evacuation towns and this contrast continued in the June quarter when the schools were operating again. Measles and whooping-cough deaths during the March and June quarters in the evacuation towns and in Greater London were very few in comparison with previous years while the neutral towns showed only a moderate fall and the reception towns very little change. For instance in Greater London deaths from measles in the first half of 1940 numbered only 5 compared with 339 in 1938, and 860 in 1936, the last biennial epidemics. The levels and movements of the notification rates for both diseases suggest the removal of the schools as centres of infection during the winter in the evacuation areas and an intensification of infection, perhaps aided by lower levels of general immunity, in the reception towns. New York, however, has also had in 1938-40 the rare experience of two successive winters of low measles prevalence, so the possibility of other explanations must not be overlooked. The cerebrospinal fever notification rate at all ages and the death-rate at ages over 15 during the March quarter of 1940 were higher in the reception towns than elsewhere but this difference was not maintained in the June quarter. Deaths in the first quarter in England and Wales numbered 24 per cent of notifications and varied between 32 per cent in some of the northern counties and 17 per cent in South Wales. The age distribution shows an excessive proportion of elderly women, 15.1 per cent of the deaths of females being at ages 55 or over compared with only 4.7 per cent of males. A. BRADFORD HILL.

Reprinted from "Bulletin of Hygiene," Vol. 16, No. 2.

BRAUER, E. **Immunized Persons as Diphtheria Carriers.** [Correspondence.] *Brit. M. J.* 1940, Nov. 16, 683-4.

The fear that immunized persons may become diphtheria carriers has been expressed again and again and that this fear is not unwarranted the facts recorded by the author bear witness. A child of 5 years was found to be suffering from nasal diphtheria and was removed to hospital. Sharing the house was another family with three children, a boy aged 13 and two girls aged 9 and 5 years. The boy had had diphtheria five years before and the two girls were immunized the following year. All three were swabbed, when the case above-mentioned developed; the boy's swab was reported negative, those of the two girls were positive, although neither presented any indication of disease. In other words, states the author, "the child who had gone through an actual attack of diphtheria was completely immune

against it and proved negative, the other two children, who had been vaccinated against the disease, were immune against contracting diphtheria although they carried the organism in their noses." H. H. S.

Reprinted from "Bulletin of Hygiene," Vol. 16, No. 2.

MACLEAN, I. H. Prophylactic Inoculation against Whooping-Cough.

Proc. Roy. Soc. Med. 1940, v. 33, 425-32 (Sect. Therap. & Pharmacol., 19-26). [19 refs.]

The views on and results of active immunization against whooping-cough were gathered from the author's experiences in a London whooping-cough clinic. Pertussis vaccines should be made only from strains which are in Phase I and which are either newly isolated, or have been maintained in Phase I by growth on Bordet-Gengou medium. Also vaccines are best made from cultures grown on media containing human blood. No chemically altered vaccine is as good as the simple suspension of killed bacteria. The author is not in favour of the very large dose and believes that effective prophylaxis consists in a primary stimulus followed by a secondary stimulus after an appropriate interval. He therefore gives a course of three injections each of 4,000 million organisms, at intervals of three to seven days, following this up with a final injection of the same strength after the lapse of a month. Employing this method in a test group of 513 children with 46 known exposures and 45 suspected exposures not a single case of whooping-cough occurred. In a control group of 154 children with 115 exposures, 89 cases of the disease occurred. The earliest age at which immunization can be attempted successfully is between 6 and 12 months. Children of this age, may safely be given the full scale of dosage and from this period until 7 or 8 years of age they are easily immunized. Also immunization may be undertaken safely during epidemic periods though this is not the best time to choose. Active artificial immunity is generally considered to be life-long but in the face of exaggerated exposure immunity can only be relative. Whooping-cough in a vaccinated child is usually mild or atypical. A. JOE.

Reprinted from "Bulletin of Hygiene," Vol. 16, No. 2.

CHICK, HARRIETTE. Nutritive Value of White Flour with Vitamin B₁ Added and of Wholemeal Flour. *Lancet.* 1940, Oct. 26, 511-12, 1 chart.

The Ministry of Food intends to reinforce white flour with vitamin B₁ in order to make its nutritive value more nearly equal to that of wholemeal flour. The lower B₁ content of white flour is, however, only one of its defects as compared with wholemeal. Straight-run white flour (73 per cent extraction) which is the ordinary white flour in use is not only poorer in B₁ but has a lower content of other B vitamins (riboflavin, nicotinic acid, B and filtrate factor) and also of proteins and minerals. The combination of proteins in wholemeal has been shown to have a higher nutritive value

for growth, weight for weight than those of the endosperm. In the present paper, two diets were given to young rats. Diet 1 contained white flour with 10 micrograms pure B₁ added. Diet 2 was the same as diet 1 except that wholemeal flour replaced the white flour and no extra B₁ was added. In the first two weeks, the growth on white flour and B₁ was only half that on wholemeal flour. The groups were then reversed and the slower group, now given wholemeal flour, shot ahead, gaining 24 grammes weekly, whereas the quicker growing group now given white flour fell back and only gained 7 grammes weekly. The digestibility of the white flour was greater, the faeces passed being only one-fifth of those passed on wholemeal, but the utilization of assimilated food was inferior, the amount of food ingested corresponding to 1 gramme gain in body-weight being 3.02 grammes on the white flour diet and 2.47 grammes on the wholemeal. Preliminary trials suggested that perhaps the most serious deficiency might be riboflavin. It is thought unlikely that a shortage of B₆ occurs as it is present in such large quantities all through the grain of cereals. [It seems to the reviewer desirable to point out that in view of the fact that riboflavin is widely distributed in other foods used for human consumption—in milk, meat and vegetables for example—a deficiency of riboflavin in white flour would not necessarily lead to a shortage of this factor in the diet. Moreover, the fortified white flour will contain a valuable addition of calcium.]

DOUGLAS C. HARRISON.

Reprinted from "Bulletin of Hygiene," Vol. 16, No. 2.

THOMAS, CARMEN C., and MILLER, EVELYN E. **Rotenone in the Treatment of Scabies. A New, Nonodorous, Nonirritating Form of Treatment. Preliminary Report.** *Amer. J. M. Sci.* 1940, v. 199, 670-74.

Rotenone was originally extracted from derris root (*Derris elliptica*) of which it constitutes 5-9 per cent, and now from *Lonchocarpus nicou* (South American cuberoot) which has a content of about 7 per cent. It is widely used in veterinary medicine for demodectic mange and as a constituent of flea powders. It is colourless, crystalline, insoluble in water but readily soluble in alcohol, ether, acetone, chloroform, benzene, or carbon tetrachloride. Though toxic by mouth, it is not absorbed by the skin. For trial in scabies cases, 1 gramme of rotenone was dissolved in 3 c.c. chloroform, and added, with vigorous shaking, to a mucilage of quince seed and Irish moss to make 1.2 per cent lotion; 0.1 per cent sodium benzoate is added as a preservative. For scabies patients the procedure adopted was the following:

"*First night.*—Bathe with hot water and soap, soaking well and scrubbing all over with a stiff brush. Dry. Rub lotion in well over whole body, except face and scalp. Special attention to hands, armpits, waist, nipples and groins.

"*Next morning*.—Rub lotion in again, without bath. Wear same underwear.

"*Next evening*.—Rub lotion in a third time, without bath.

"*Second morning*.—Rub lotion in a fourth time, without bath.

"*Following evening*.—Bathe thoroughly. Put on fresh underwear, change all bedding, and send to the laundry. Do not apply any more of the medicine, without first returning to the clinic."

Even severely irritated skins gained immediate relief; mild cases were cured in two days, severe ones in a week. The 1 per cent strength usually sufficed, but 2 per cent was better for severe cases; rarely was a second course needed. It is worth trial in other parasitic dermatoses, such as pediculosis, trombidiasis, etc.

H. H. S.

Reprinted from "Bulletin of Hygiene," Vol. 15, No. 8.

Reviews.

SOME ELEMENTARY NOTES ON MILITARY LAW AND PROCEDURE. By Captain P. M. C. Hayman. Cheltenham and London: Cheltenham Press, Ltd. Pp. 70.

The author of this small book has had a great and varied experience of military and civil law. He has produced a book in which the only fault that can be found is the modesty of its title. In a small space it deals with the whole of military law as it is likely to be encountered in the company office. Every reference is given in a good wide margin which also allows space for notes, so that on every point the correct place in the Manual of Military Law or King's Regulations can be rapidly found. Even more remarkable is the fact that in a book of this sort, the author has managed to compress a good deal of quiet humour which makes the book much more entertaining to read on a subject usually considered to be dry. This is a first-class book and it would be invaluable in a company office. C. C.

NEUROSYPHILIS (SYPHILIS OF THE NERVOUS SYSTEM). By C. Worster-Drought, M.A., M.D.Cantab., F.R.C.P.Lond. (Modern Medicine Monographs.) London: John Bale & Staples Limited. 1940. Pp. xiv + 241. Price 10s. 6d.

Dr. Worster-Drought's "Neurosypphilis" possesses the great advantage that all that most people want to know about the subject is contained in one small volume.

The whole subject is adequately dealt with and the illustrations are excellent; the section on prognosis should prove particularly helpful. It is encouraging to note that the author believes that it is not the arsenicals

themselves, but their use in inadequate dosage, which predisposes to neurosyphilis. In this he has the support of most clear-thinking syphilologists. Neither tryparsamide nor physical methods of inducing hyperpyrexia receive the attention they deserve whilst there are numerous errors in the text, e.g. *Spirochæte pallida*, *myotonic atrophica*, and the statement that injectio bismuthi B.P. contains 0.02 gramme of the metal in each c.c. Again, 15 mgm. per kilogram of body weight is not an average dose of neoarsphenamine nor is a dose of sulpharsphenamine usually prepared for injection in the same way as neoarsphenamine (i.e. by solution in 6 to 10 c.c. of distilled water).

With the above reservations this little book can be recommended with confidence to all syphilologists.

There is a useful bibliography.

THE NEW M.O. METHOD BEFORE MEDICINES. Privately printed.

A copy of a very useful little book, entitled "The New M.O." has been received from the author, Colonel C. Arthur Webster.

It is primarily intended for medical officers attached to regiments in an A.A. Division but will be of use to all in medical charge of independent units.

Certain passages, however, as, for instance, that on page 10, dealing with Regimental Aid Posts, must be regarded as appropriate to A.A. units alone and would certainly be inapplicable to the R.M.P. of mobile battalions or regiments.

The author is to be congratulated upon the production of a very readable booklet.

J. L. C.

HANDBOOK OF ANÆSTHETICS (Formerly Ross and Fairlie). Fifth Edition.

By R. J. Minnitt, M.D. Liverpool, D.A. R.C.P. and S.Eng., Lecturer in Anæsthetics, University of Liverpool. Edinburgh: E. & S. Livingstone. 1940. Pp. xiv + 364. Crown 8vo. 380 pages. 103 illustrations. Price 12s. 6d. net.

The appearance of a new edition of this Handbook of Anæsthetics—its fifth in twenty-one years—is proof of its popularity. The untimely death of Dr. H. P. Fairlie has compelled the publishers to look for a new author and they have been fortunate to secure the services of Dr. R. J. Minnitt.

In the preface to this edition, Dr. Minnitt states that he has been chary of eliminating anything that has been productive of sound learning and yet which may not have been couched in terms of modern knowledge. This, no doubt, accounts for the fact that some of the methods advocated are not in accordance with modern practice, such as giving chloroform in a semi-sitting position for intranasal operations after packing the nose with adrenalin as described in Chapter 19. The modern method would be to

withhold chloroform and carry out induction with nitrous oxide, oxygen and ether and maintain anæsthesia with an oral endotracheal tube and pharyngeal pack.

Three additional chapters have been written, one on Cyclopropane and Closed Circuit Carbon Dioxide Absorption Anæsthesia, the second on Vinesthene and the third on The Therapeutic Use of Oxygen, Helium and Carbon Dioxide. These three chapters are an important addition to the book.

The chapters on the intravenous methods are somewhat brief and no mention is made of the great value of pentothal sodium in producing short deep anæsthesia with complete muscular relaxation, so useful in manipulative surgery and in reducing dislocations.

As might be expected from the pen of Dr. Minnitt, the chapter on analgesia and anæsthesia in obstetrics is excellent.

The section on endo-tracheal anæsthesia still contains a full account of the almost obsolete method of insufflation which has been replaced by the inhalation method of Magill.

The chapter on local analgesia is good and clear and the same may be said of the section on spinal analgesia though most anæsthetists would doubt the wisdom of spinal injection in the case of acute intestinal obstruction with regurgitant vomiting as advocated on page 340.

The type and illustrations remain excellent. This is a book which should continue to be of great value to students and practitioners and especially useful from a Service point of view.

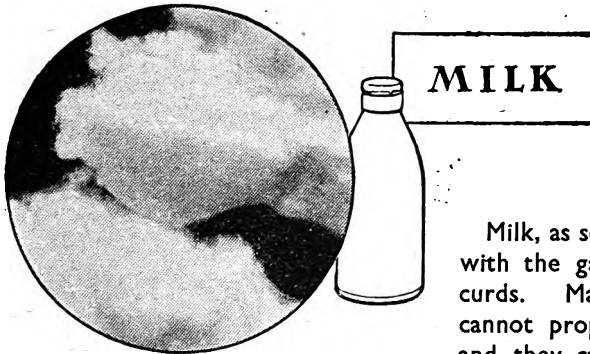
A. S. D.

A SHORT PRACTICE OF SURGERY. Fifth Edition. By Hamilton Bailey, F.R.C.S., and R. J. McNeill Love, M.S., F.R.C.S. London: H. K. Lewis & Co., Ltd. 1941. Pp. viii + 1016; Illus. 880 (116 coloured); Demy 8vo. Price 30s. net.

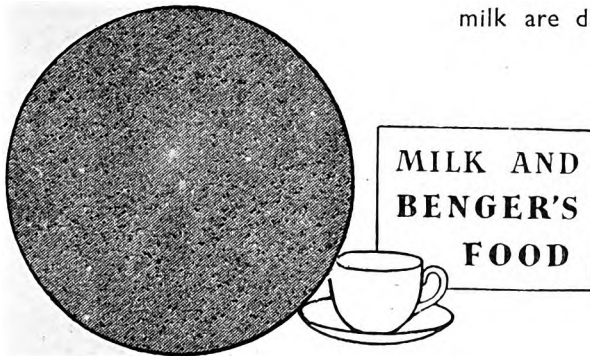
The above volume is now a well-established student's textbook and the appearance of a Fifth Edition in ten years speaks well for its popularity. The size of a surgical textbook always provides difficulty. Too long a book overwhelms many students; too short a one provides inadequate knowledge. The authors, who should be well able to judge the student's mind, have always concentrated on conciseness and in this edition have added only a few pages. Many of the accounts of disease may appear to be brief and to convey but a poor picture to the mind's eye but, before offering criticism, it is well to consider whether more knowledge could have been conveyed in fewer pages. Criticism will then probably be silenced.

The production of this volume is good and the illustrations excellent. Good sub-titles are invaluable to a student but in places enthusiasm seems to have outrun discretion and tends to result in confusion. This is particularly evident in the chapter dealing with hernia where the sub-title of "Special Forms of Inguinal Hernia" achieves more prominence than the introductory title of "Inguinal Hernia."

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Revision has on the whole been well done and the student will certainly never be deterred from reading by feeling that his subject-matter is already out of date. The chapter on acute appendicitis is good but perhaps in a future edition a small paragraph might be added regarding the relative absence of signs and symptoms and the urgency of early operation in childhood. The text (p. 373) also unfortunately suggests that, in acute appendicitis, where the possibility of primary disease of the uterine adnexæ cannot be excluded, a Battle's incision rather than a paramedian incision is desirable.

This textbook's popularity should be maintained by the present edition.
D. S. P. W.

Notices.

SANITARY INSPECTORS' EXAMINATION.

FOR the duration of the war candidates who have served in the Hygiene Sections of the Royal Army Medical Corps will be allowed by the R.S.I. and S.I.E. Joint Board to qualify under regulation 4 by producing a certificate of having worked 125 days in a public health department spread over a period of not less than six months and of having received instruction during that time in all branches of the work and duties of a sanitary inspector for not less than 150 working hours.

"PERCAINE" HANDBOOK.

Under this title, a small handbook has been published by Messrs. Ciba, Ltd., The Laboratories, Horsham, Sussex, the manufacturers of "Percaïne" spinal anæsthetic.

Officers Commanding Military Hospitals in which this anæsthetic is used may, if they wish, obtain a copy of the handbook on application direct to the firm.

JOURNAL OF THE ROYAL ARMY MEDICAL CORPS

Corps News.

AUGUST, 1941.

EXTRACTS FROM THE "LONDON GAZETTE."

June 17.—The undermentioned Lt.-Cols. ret. pay (late R.A.M.C.), at their own request, revert to the rank of Maj. whilst empld. during the present emergency.

A. H. Bond (1030). Apr. 3, 1940.

G. A. K. H. Reed (9897). Apr. 3, 1940.

M. White, M.C., M.B. (15600). Apr. 3, 1940.

S. J. A. H. Walshe, D.S.O. (1641). July 29, 1940.

June 20.—Maj. H. G. P. Armitage (15782), having attained the age for retirement, retires June 3, 1941, and remains empld.

Short Service Commission.—The appt. of Lt. D. N. Parry (75587) is antedated to July 1, 1937, under the provs. of Art. 36, Royal Warrant for Pay and Promotion, 1940, but not to carry pay and allces. prior to July 1, 1938.

Lt. D. N. Parry (75587), to be Capt. July 1, 1939, with seniority July 1, 1938. (Substituted for the notfn. in the *Gazette* of July 18, 1939.)

Surgn. Lt.-Col. (temp. Col.) E. A. Strachan, M.B. (15686), having attained the age for retirement, retires Mar. 12, 1941, and remains empld.

Short Service Commission.—Capt. E. J. Crowe (67845), retires, receiving a gratuity. Apr. 23, 1941.

July 1.—Lt.-Col. W. H. Cornelius (6813) retires and remains empld. July 2, 1941.

Maj. (temp. Lt.-Col.) J. H. Bayley, M.C. (8621), to be Lt.-Col. July 2, 1941.

Capt. (Qr.-Mr.) H. M. Prince (56852) to be Maj. (Qr.-Mr.). July 1, 1941.

The undermentioned at their own request revert to the rank stated whilst empld. during the present emergency:

As Majs.:

Col. W. D. C. Kelly, D.S.O., M.B. (1982), ret. pay (late R.A.M.C.). Apr. 3, 1940.

Lt.-Col. E. Bennett (9907), ret. pay (late R.A.M.C.). Apr. 3, 1940.

Lt.-Col. G. H. J. Brown, D.S.O., M.B. (9970), ret. pay (late R.A.M.C.). Apr. 3, 1940.

Lt.-Col. F. P. Lauder (10183), ret. pay (late R.A.M.C.). Apr. 3, 1940.

Lt.-Col. W. Bowater, M.C. (16701) (R.A.M.C. T.A.) (Res. of Off.). June 1, 1941.

July 11.—Lt.-Col. W. H. Cornelius (6813), having attained the age for retirement, retires and remains empld. July 2, 1941. (Substituted for the notfn. in the *Gazette* of July 1, 1941.)

The undermentioned Lt.-Cols., ret. pay (late R.A.M.C.), at their own request, revert to the rank of Maj. whilst empld. during the present emergency. July 29, 1940:

R. F. O'T. Dickinson, O.B.E., M.B. (26035).

R. K. White, D.S.O. (14732).

Maj. L. G. Gibson, R.A.M.C. (8511), reverts to ret. pay on ceasing to be re-employed on account of ill-health, and resumes the rank of Lt.-Col. July 12, 1941.

July 15.—*Short Service Commission.*—The appt. of Lt. K. P. Brown, M.B. (74435), is ante-dated to Feb. 1, 1937, under the provs. of Art. 39, Royal Warrant for Pay and Promotion, 1940, but not to carry pay and allces. prior to Feb. 1, 1938.

Lt. K. P. Brown, M.B. (74435), to be Capt. Feb. 1, 1939, with seniority Feb. 1, 1938. (Substituted for the notfn. in the *Gazette* of Feb. 14, 1939.)

July 15.—The KING has been graciously pleased to approve that the following be Mentioned for distinguished services in the field:

ROYAL ARMY MEDICAL CORPS.

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TERRITORIAL ARMY.

July 1.—War Subs. Capt. H. E. Anderson (87627) relinquishes his commn. on account of ill-health. July 2, 1941.

July 11.—The KING has been graciously pleased to confer "The Efficiency Decoration" upon the following officers of the Territorial Army:

Lieutenant-Colonel G. G. Talbot, M.B., F.R.C.S. (67248).

Major (temporary Lieutenant-Colonel) T. C. McKenzie, M.B. (7299).

Major (acting Lieutenant-Colonel) G. M. Lewis (30263).

Major A. Angus, M.D. (32613).

QUEEN ALEXANDRA'S IMPERIAL MILITARY NURSING SERVICE.

June 17.—The undermentioned Sisters resign their appointments:

Miss M. R. Terry. Mar. 21, 1941.

Miss A. B. P. Smele. June 1, 1941.

July 11.—The undermentioned Sisters resign their appts:

Miss H. Gourley. May 6, 1941.

Miss J. F. McKay. June 30, 1941.

July 15.—Sister Miss V. D. A. Powell, retires receiving a gratuity on account of ill-health. July 16, 1941.

APPOINTMENT VACANT.

COUNTY BOROUGH OF BIRKENHEAD.

CIVIL DEFENCE MEDICAL OFFICER.

Applications are invited from fully-qualified male Medical Practitioners for the Post of Medical Officer in Charge, Civil Defence Medical Services.

Salary at the rate of £750 per annum.

The Officer appointed will be required to reside within the Borough, and devote his whole time to the duties of the post.

The appointment will be for the duration of the war only. Retired Regular Army,

Navy and Air Force Medical Officers, and Practitioners who have had administrative Civil Defence Medical experience, will be regarded as specially eligible.

Applications, giving age, qualifications with dates, and record of experiences, together with copies of recent testimonials, should be sent immediately to Dr. D. Morley Mathieson, Medical Officer of Health, 9, Hamilton Square, Birkenhead, from whom any further particulars required regarding the appointment may be obtained.

ROYAL ARMY MEDICAL CORPS AND THE ARMY DENTAL CORPS COMFORTS GUILD.

It was with much regret that the Committee received the resignation of Lady MacArthur, the President and Honorary Treasurer of the Guild.

It was her energy and enthusiasm that brought the Guild into being in August last. Ever since she has been unsparing in her efforts to make it a success. She will be sadly missed.

We welcomed Mrs. Hood as a member of the Committee some months ago and it is hoped that she will consent to become our President.

Mrs. Garraway is the new Honorary Treasurer and her place as Honorary Secretary has been taken by Mrs. Richmond, with Mrs. Sandiford as Assistant Honorary Secretary.

We do hope that everyone will continue to support the Guild, both by subscribing and knitting, so that we can do much good work this winter.

Since our Notes last month a second cheque for £100 has been sent to the British Red Cross and St. John Ambulance Prisoners of War Fund. This has been gratefully acknowledged and they are again writing to the R.A.M.C. and A.D. Corps men in each camp to tell them that their parcels have been subscribed for by the Comforts Guild. We hope to send further sums as funds permit.

We received one or two unexpected windfalls last month—£20 from the proceeds of a collection made at a R.A.M.C. Band Concert at Chester and £15 from another at Shrewsbury. One unit has sent us two books

of savings stamps and another has decided to subscribe sixpence per head every month towards the Prisoners of War Fund. This is all most encouraging.

We have now despatched parcels of woollen comforts, books, games, &c., to the Middle East. We hope that they will arrive safely before the winter. There are still many units to be done. During the summer we have discontinued sending woollies at home, but we have kept up games and books to Field Units, who are very glad to receive them judging from the letters we have.

It is to be regretted that there has been so much delay over the Badges. Some have been received and have been sent to those who had applied for them. On ceasing to work for the Guild it is understood that the Badge will no longer be worn.

*R.A.M.C. Headquarters Mess,
Millbank, London, S.W.1.*

We publish the following letter sent to Lady MacArthur by the Director-General:

DEAR LADY MAC ARTHUR,

On your retirement from the Presidency of the Royal Army Medical Corps and The Army Dental Corps Comforts Guild, I should like to thank you on behalf of the Officers, Warrant Officers, Non-Commissioned Officers and Men of the Royal Army Medical Corps and The Army Dental Corps for all the great work you have done for the Guild.

By your initiative and inspiring leadership the Guild has brought bodily comfort and mental recreation to thousands of our men serving in all parts of the world.

To you, I am sure, it will be gratifying to know that the Guild through your untiring

efforts has become the successful organization that it is to-day.

Hobart House,
Grosvenor Place,
S.W.1.

Believe me,
Yours sincerely,
(Signed) ALEX. HOOD.

August 14, 1941.

DIED OF WOUNDS.

EASTON.—Captain Robert Thomson Easton, M.B., R.A.M.C., died of wounds in the Middle East in May, 1941. Born July 25, 1903, he was educated at Aberdeen, where he graduated M.B. in 1927. He had been House Surgeon and House Physician, Royal Infirmary, Oldham. Commissioned Lieutenant R.A.M.C. T.A., July 15, 1939,

he was promoted Captain July 15, 1940, with seniority Jan. 15, 1939.

GREATOREX.—Lieutenant Thomas William Greatorex, died in May, of wounds, in the Middle East. The only son of Dr. R. W. Greatorex of Halifax, he was born June 21, 1914, and commissioned Lieutenant (War Emergency Commission) R.A.M.C., Dec. 13, 1940.

DIED OF WOUNDS RECEIVED IN ACTION.

HAIR.—In April Lieutenant Alastair Hair. Elder son of the Rev. James and Mrs. Hair, of Edinburgh, he was born Sept. 25, 1904, and educated at Glasgow University, where he graduated M.B. in 1931. He had

been M.O.H. Llandrindod Wells since 1935. He was commissioned Lieutenant (War Emergency Commission) R.A.M.C., May 2, 1940.

KILLED.

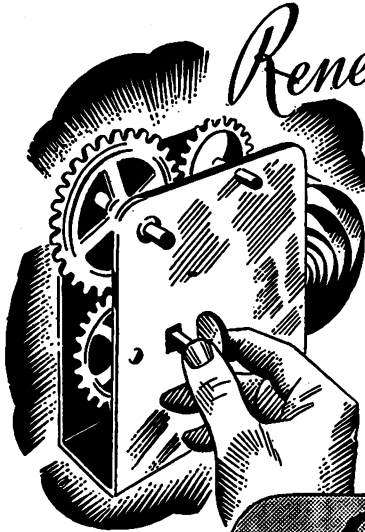
BONNELL.—Acting Major Henry Emrys Bonnell, R.A.M.C., B.Sc., Wales, is reported in *The Times* as killed. Born Nov. 4, 1905, he was commissioned Lieutenant R.A.M.C. T.A. June 6, 1939, promoted Captain June 6, 1940, and had been appointed Temporary Major on Dec. 15, 1939. He took the M.R.C.S. and L.R.C.P. in 1931, and was Pathologist East Ham Memorial Hospital and Consulting Pathologist Runwell Hospital for Nervous Disorders, previous to which he had held the appointments of Assistant Pathologist Royal East Sussex Hospital, Hastings, and Clinical Pathologist King's College Hospital and Manchester Royal Infirmary.

promoted Captain April 19, 1940, and had been appointed Temporary Major Dec. 3, 1939.

WARD.—Major Richard Fowler Ward. Born Nov. 6, 1902, he was educated at the London Hospital. He took the M.B. London, in 1927, and the F.R.C.S. Edinburgh, in 1930. He was Honorary Surgeon in charge Uro-Genital Dept., East Suffolk and Ipswich Hospital, and had held the appointments of Clinical Assistant Out-Patients, London Hospital; Casualty Officer and House Surgeon East Suffolk and Ipswich Hospital and Senior House Surgeon Derbyshire Royal Infirmary. Commissioned Lieutenant R.A.M.C. T.A. Dec. 2, 1928, he was promoted Captain June 2, 1932, and Major Dec. 2, 1938.

ROUSE.—Temporary Major James Edward Colleton Rouse, R.A.M.C., was shown in *The Times* of July 2, 1941, as killed. Born Aug. 18, 1902, he was educated at St. George's Hospital, where he took the Brackenbury Surgical Prize. He took the M.B. London, in 1927, and the D.A. England, in 1936. He was Honorary Anaesthetist Worthing Hospital and Hove General Hospital; Honorary Medical Officer Royal Surrey County Hospital, and had been House Surgeon and House Physician and Resident Anaesthetist at St. George's Hospital. Commissioned Lieutenant in the R.A.M.C. Supplementary Reserve April 19, 1939, he was

WARDROP.—Temporary Major David Wardrop, R.A.M.C., has been shown in *The Times* of July 2, 1941, as killed. Born Nov. 30, 1904, he was commissioned Lieutenant (War Emergency Commission) R.A.M.C. June 6, 1940, and had been appointed Temporary Major Jan. 18, 1941. Educated at Birmingham and St. Mary's Hospital, he took the M.R.C.S. Eng., and the L.R.C.P. London, in 1928, and the F.R.C.S. Edinburgh in 1931. He had been Surgical Registrar, House Physician and House Surgeon of the General Hospital, Birmingham,



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Correspondence on matters of interest to the Corps, and articles of a non-scientific character, may be accepted for publication under a nom-de-plume.

All Communications or Articles accepted and published in the "Journal of the Royal Army Medical Corps," will (unless the Author notifies at the time of submission that he reserves the copyright of the Article to himself) become the property of the Library and Journal Committee, who will exercise full copyright powers concerning such Articles.

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Communications in regard to editorial business should be addressed—"The Editor, JOURNAL OF THE ROYAL ARMY MEDICAL CORPS, A.M.D.5, Hobart House, Grosvenor Place, S.W.1."

MANAGER'S NOTICES.

The Annual Subscription for the JOURNAL OF THE ROYAL ARMY MEDICAL CORPS is £1 payable in advance. Single copies, 2s. 6d. per copy.

Cheques, etc., should be made payable to the "Journal R.A.M.C.," and crossed "Holt & Co."

Communications in regard to subscriptions, change of address, etc., should be addressed "THE MANAGER, JOURNAL OF THE ROYAL ARMY MEDICAL CORPS, A.M.D.2, Hobart House, Grosvenor Place, S.W.1."

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DEATHS.

POWER.—On June 23, 1940, Major Robert Ignatius Power, R.A.M.C., retired. Born July 31, 1857, he took the Licenses of the Royal Colleges of Physicians and Surgeons, Ireland, in 1881. Commissioned Surgeon May 30, 1885, he was promoted Surgeon Major May 30, 1897, and retired as Major May 30, 1905. He was employed when on the Retired List at Waterford from Sept. 1, 1905, till Jan. 31, 1918. He served in South Africa from 1900 till 1902 taking part in the action at Colesberg (Feb. 12, 1900); operations in the Orange Free State; action at Belfast (Aug. 26 and 27, 1900); operations on the Zululand Frontier of Natal in Sept. and Oct. 1901. He was awarded the Queen's Medal with three Clasps and the King's Medal with two Clasps.

ALDERSON.—While Prisoner of War, on Mar. 20, 1941, Major Christopher Rowland Alderson, M.C., M.M. Born in Bradford, Yorks, June 3, 1893, he joined the Liverpool Scottish in 1913 and transferred to the Royal Engineers in Sept. 1915, in which he was commissioned as Temporary Second Lieutenant, April 26, 1917, and promoted Temporary Lieutenant, Oct. 26, 1918. He relinquished his commission, retaining his rank of Lieutenant, Jan. 16, 1920. He served in France from Oct. 1914, till Sept. 1918, and in North Russia from March till Sept., 1919, being awarded the Military Medal—*London Gazette*, Oct. 21, 1916, and the Military Cross—*London Gazette*, Jan. 18, 1918. Taking the M.R.C.S. Eng., and the L.R.C.P.Lond., in 1925, he was Assistant Anaesthetist Eastbourne Ear, Throat and Nose Hospital and District Medical Officer, Eastbourne. Recommended Major R.A.M.C. T.A., April 26, 1939, he was shown missing June 19, 1940.

MOLESWORTH.—On May 22, 1941, Lieutenant-Colonel Robert Everard Molesworth, R.A.M.C., retired. Born July 7, 1861, he was commissioned Surgeon May 30, 1885, Surgeon Major May 30, 1897, and Lieutenant-Colonel R.A.M.C. May 30, 1905. He retired Mar. 6, 1907, and was re-employed Nov. 25, 1914, till Feb. 29, 1920, after which he accepted employment under the Foreign and Political Office, India, till Feb. 28, 1922.

In the South African War he took part in the Relief of Kimberley and the operations at Paardeberg (Feb. 17 to 26, 1900) being awarded the Queen's Medal with two Clasps.

STARR.—On active service in the Middle East, in May, 1941, Captain Donald Starr. Only son of Mr. and Mrs. J. Starr of Wigan, he was born on Mar. 25, 1902, and graduated M.B. Manchester, 1926. He had held the posts of House Surgeon at the Manchester

Royal Infirmary and Medical Officer of the Kent County Mental Hospital. He leaves a widow. He was commissioned Lieutenant (War Emergency Commission) R.A.M.C. Dec. 5, 1939, and promoted Captain Dec. 5, 1940.

PIKE.—In Lincoln on June 26, 1941, Major-General Sir William Watson Pike, K.C.M.G., D.S.O., F.R.C.S.I., late R.A.M.C., retired. Sir William was a son of William Pike, J.P., of Glendaray, Co. Mayo, where he was born on Mar. 10, 1860. He took the licenses of the Irish Colleges of Surgeons and Physicians in 1880 and the Fellowship of the former in 1888. Commissioned Surgeon Feb. 4, 1882, he was promoted Surgeon Major Feb. 4, 1894, Lieutenant-Colonel Feb. 4, 1902, Colonel Nov. 9, 1911, and, for distinguished service in the Field, Surgeon General June 3, 1917. He retired Mar. 10, 1920. A genial, fine-looking active man, he was four years an International Rugby player and also took part in inter-Provincial Irish Hockey. He was an expert shot with rifle and gun. He served in South Africa 1899–1902, taking part in the Relief of Kimberley; operations at Paardeberg (Feb. 17 to 24, 1900), actions at Poplar Grove and Dreifontein, and operations in the Transvaal and Cape Colony. Twice mentioned in despatches, he was awarded the D.S.O., Queen's Medal with five Clasps and King's Medal with two Clasps. He arrived from India in France in Dec., 1914, and served there first as D.D.M.S. Indian Cavalry Corps and subsequently as D.D.M.S. Indian Army Corps and D.M.S. 1 Army till Jan., 1917. He served on Special Commissions in East Africa in 1917–1918, and in India 1918–1919. Four times mentioned in despatches and brought to notice for valuable services rendered he was promoted Surgeon General, created C.M.G., K.C.M.G., Grand Officer Order of Avis and awarded the 1914–1915 Star, British War and Victory Medals.

LLOYD.—In St. Leonards-on-Sea, on July 5, 1941, Major-General Sir Owen Edward Pennefather Lloyd, V.C., K.C.B., late R.A.M.C., retired. Colonel Commandant R.A.M.C. 1922 to 1924.

Son of Major M. Pennefather Lloyd, 59 Regiment, of Co. Roscommon, he was born Jan. 1, 1854. Educated at Fermoy College and in Cork he took the L.R.C.P. and L.R.C.S. Edinburgh in 1877. He served for a short time in the Royal Scots Greys. Commissioned Surgeon Aug. 4, 1878, he was promoted Surgeon Major Aug. 4, 1890; Lieutenant-Colonel Aug. 4, 1898, Surgeon General Nov. 17, 1909, and retired Jan. 1, 1914. He was re-employed Jan. 22, 1915, till Mar. 31, 1918. He was

Honorary Surgeon to the Viceroy. Created C.B. in 1910, and K.C.B. 1923.

In 1894-1895 he was Medical Officer to the Franco-British Boundary Commission on the Mekong River. In 1898-1899 he was Medical Officer to the British Chinese Boundary Commission on the Burma Frontier and acted as H.B.M. Commissioner during the absence of Sir G. Scott.

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Matab Singh back for further assistance, and remained with Captain Morton till the Subadar returned with five men of the Magwe Battalion of Military Police, when he assisted in carrying Captain Morton back to the fort where that officer died a few minutes afterwards. The enemy were within ten or fifteen paces, keeping up a heavy fire, which killed three men of the picket, and also Bugler Burna Singh. This man accompanied Captain Morton from the fort, showed great gallantry in supporting him in his arms when wounded, and was shot while helping to carry him back to the fort. (The native officer and five sepoy above alluded to were awarded the Order of Merit.) Sir Owen also received the Medal with Clasp.

During the war of 1914-1918 he was D.D.M.S. Southern Command and brought to notice for valuable services rendered.—War Office Communique, Sept. 18, 1917.

HAYWARD.—The death of Captain Frank Robert Oliver Hayward, R.A.M.C., is announced. Born Aug. 5, 1907, he was educated at Guy's Hospital and took the L.R.C.P. and M.R.C.S. in 1932. He was Honorary Anæsthetist at Chelmsford Hospital and had been House Physician of St. Bartholomew's Hospital, Rochester. Gazetted Lieutenant (War Emergency Commission) R.A.M.C., Nov. 3, 1939, he was promoted Captain (War Substantive) Nov. 3, 1940.

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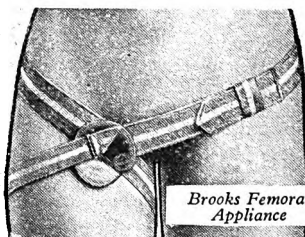
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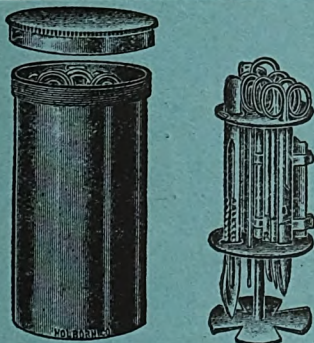
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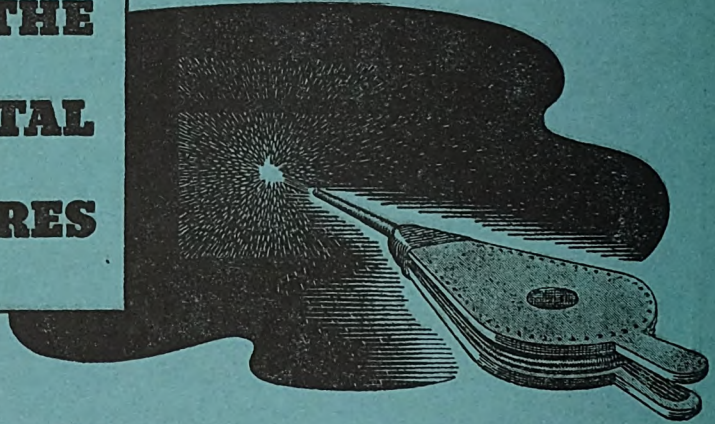
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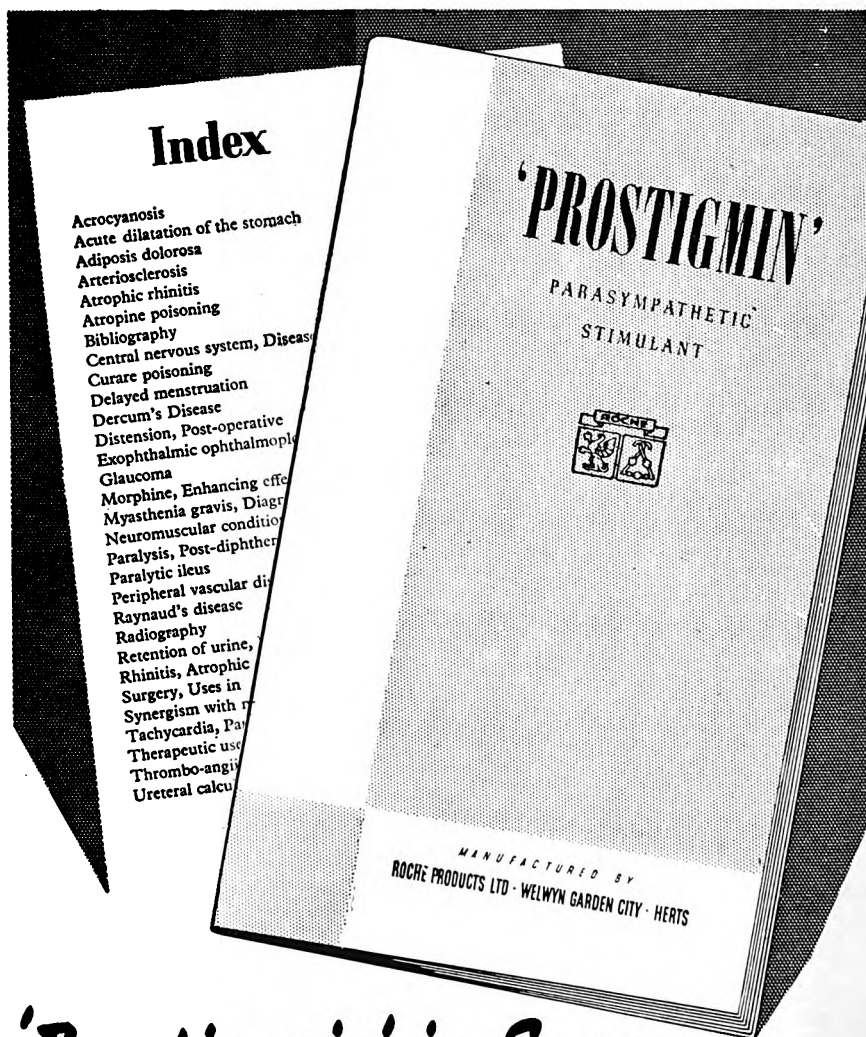
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Mr. B aged 53. Four years ago early sub-acute combined degeneration was diagnosed and parenteral liver extract was given for four years. At the end of this time the blood picture was far from normal and clinical signs of pernicious anaemia existed. Intensive treatment with parenteral liver extract for four months produced no change. 6 x 2 c.c. doses of Hepatex-T were given on successive days and a distinct improvement was noted. Treatment was then continued with Neo-Hepatex and after six weeks the blood picture was normal and the patient was well. Maintenance dosage was instituted for a further seven months and the patient's blood remained normal.

CONCLUSION. *Hepatex-T obviously changed the haemopoietic tissues in such a manner that Neo-Hepatex was able to exert its full effect.*

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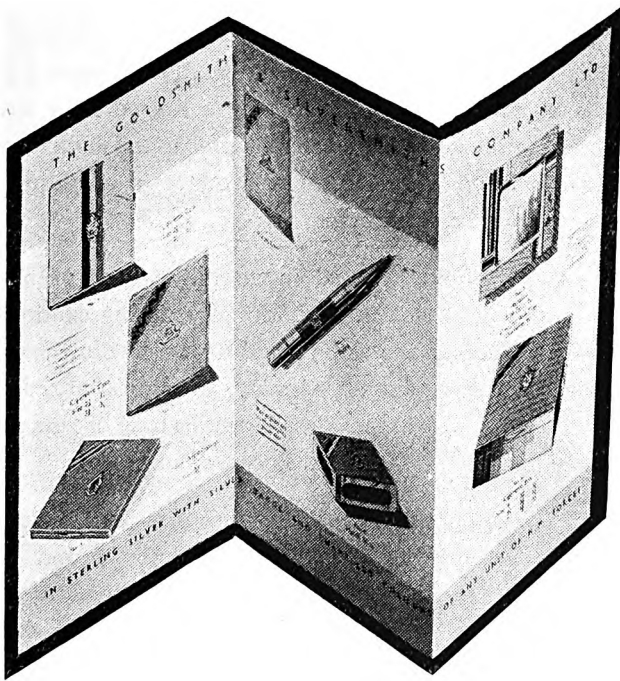
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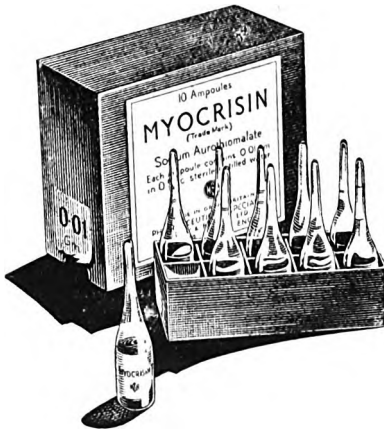
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To face first matter

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SOME ASPECTS OF WOUND SHOCK WITH EXPERIENCES IN TREATMENT.

BY CAPTAIN W. d'A. MAYCOCK, M.D., MCGILL,
Royal Army Medical Corps,

AND

COLONEL L. E. H. WHITBY, C.V.O., M.C., M.D.CAMB., F.R.C.P.
(Army Blood Transfusion Service).

THE proper treatment of any bodily disorder is necessarily based upon an understanding of the fundamental changes responsible. From the clinical aspect the diagnosis of the disorder is made by correlating signs and symptoms. Many of these signs may be common to different pathological conditions and it is only when one or more are pathognomonic that a diagnosis can be made by rule of thumb. Most other states demand judgment and experience whilst some require elaborate supplementary scientific investigations. There can be no better example of these generalizations than the variety of conditions which give rise to the signs and symptoms found in what is conveniently called "shock." Shock is a broad term which describes that state in a person exhibiting lowered vitality and circulatory disturbances following upon mental or bodily injury, including the deliberate procedures of a surgical operation. The state may range from a mere faint, which quickly passes, to gross circulatory failure which cannot be recovered from. The classical symptoms and signs are a lowered blood-pressure, a pulse which is usually fast and of poor volume, pallor and/or cyanosis, especially of the lips and nails, sweating and coldness. In cases of injury the mental state is often surprisingly clear and alert, whilst

pain may be very little in proportion to the amount of tissue damage. Vomiting is common. When the blood-pressure is persistently low, later signs include reduction in urinary output followed by anuria. This battery of symptoms, sometimes trivial, sometimes serious, obviously needs to be carefully analysed in relation to cause, if proper treatment is to be prescribed. Too often the condition of "shock" is accepted as a single clinical entity and the treatment given is as vague and unscientific as the diagnosis.

War has brought the whole subject of shock very much to the fore and there has been much experience to assess and expand the valuable observations made in the war of 1914-1918. There has been opportunity to study the reactions of the human body to various combinations of injury, fear, exposure, hæmorrhage, burns, crushing, multiple fractures, head wounds and other features such as delay between injury and treatment. These observations, made on an unrestricted age group, for casualties now include the very old and the very young and not simply the fit young Service man, need to be carefully classified into groups in order that the clinician may be presented with descriptions sufficiently clear to enable him to visualize the fundamental cause of the symptoms in each individual case. New causes of circulatory collapse in the injured as well as factors which may modify the clinical picture will doubtless be discovered when the experimental and clinical work of the war is analysed and correlated. In the meanwhile the following description gives some of the known causes of circulatory collapse in the injured. The voluminous literature of the subject is briefly reviewed later.

CAUSES OF CIRCULATORY COLLAPSE IN THE INJURED.

(A) *Blood-Volume Reduction.*

This is undoubtedly the commonest cause of circulatory collapse following upon injury and is the the group in which transfusion of the appropriate fluid is usually effective. For this reason transfusion may be regarded as the most important single measure for resuscitation work. Reduction in blood-volume causes circulatory embarrassment because cardiac filling is imperfect. Consequently cardiac output, as well as the efficiency of the driving force, are greatly reduced. This leads to imperfect nutrition, particularly of the peripheral parts, and is a progressive state in which metabolism falls to a low ebb and vital tissues finally become damaged beyond recovery. Thus, in the later phases of blood-volume reduction, the peripheral capillaries may become permeable so that plasma leaks from the circulation into the tissue spaces.

Blood-volume reduction may arise in a number of ways ; the immediate or the final effects differ according to the manner in which the reduction is brought about.

(1) *Hæmorrhage.*—Frank hæmorrhage means a loss of all elements of the blood. In healthy people an acute loss not exceeding a pint is immaterial

but a loss of two pints or more is a geometrically progressive embarrassment to the circulation. Nevertheless it has been found that life can still continue for a few hours even when as much as six or seven pints are lost. And provided that adequate replacement can be made without delay many lives can be saved. The physiological reactions following upon hæmorrhage are firstly a compensatory vasoconstriction in an effort to maintain a reasonable blood-pressure and to make the best use of what blood remains, and, secondly, the absorption of fluid from the tissues in an attempt to restore blood-volume. This restoration is a more vital and urgent requirement than the making up of lost hæmoglobin. The symptoms of shock disappear in those who survive the hæmorrhage sufficiently long for blood-volume to be efficiently restored. The same occurs in those whose blood-volume is restored by transfusion. But those whose blood-volume remains reduced and whose circulation therefore continues to operate in an embarrassed manner progress to the stage of irreversible capillary damage and they begin once again to lose circulatory fluid (plasma), this time into the tissue spaces. In these, the blood becomes concentrated and this increased viscosity adds to the difficulties of the heart. Such states arise under the conditions of delayed evacuation found in battle rather than in air raid casualties who usually reach hospital within a short time of wounding.

(2) *Plasma Loss.*—(a) *At Site of Injury.*—Whenever there is tissue injury there is an exudation into the injured area. This can be observed in an injured limb when a tourniquet is removed and is shown by a rapid swelling of the tissues in the injured area quite apart from hæmorrhage itself. And so the blood lost in an acute hæmorrhage may not represent the whole of the fluid lost to the circulation; long after the hæmorrhage has ceased plasma exudation into the wounded area may continue. Plasma exudation is a serious aspect of blood-volume reduction because of the increase in blood viscosity.

(b) *Crush Injuries.*—Considerable plasma loss from the circulation occurs when any part of the body is compressed or crushed for long periods. This happens even though there is no rupture of blood-vessels or severe tissue-damage such as a fracture. The exact mechanism of this phenomenon, which is a progressive œdema into the crushed tissues accompanied by the formation of skin blisters, is not completely understood. The plasma loss may be great enough to cause a vast reduction of blood-volume. The early phases may therefore be associated with a falling blood-pressure and other symptoms of shock though, in the late phases and sometimes in the early ones, there may be a rising blood-pressure which may possibly be a symptom of developing or established renal incompetence.

(c) *Burns.*—There is always an exudation of plasma into a burned area and this lesion provides the purest example of blood-volume reduction due entirely to plasma loss. The amount lost may be very large and so cause a gross increase in blood-viscosity from hæmoconcentration. There appear

also to be other factors, tentatively suggested to be toxic substances derived from the destroyed tissue, which contribute greatly to the symptoms of circulatory collapse and which may not come into operation until a day or two after receiving the burn.

(d) *Gross Dehydration*.—Body water is maintained at a constant level by a balance between fluid intake and output. Should intake cease, output nevertheless continues. The process in a person dying of thirst is that he first excretes tissue fluid and when this source is exhausted he begins to lose fluid even from the circulation itself. The last stages of dehydration therefore give rise to blood-volume reduction accompanied by hæmoconcentration which produces symptoms of circulatory collapse. It will be appreciated that under battle conditions severe grades of dehydration may occur. Men are often potentially dehydrated before they are even wounded. They may be in places where water is difficult to obtain whilst exertion and sweating increase the fluid loss. When wounded, the reaction to blood loss is to absorb tissue fluid into the circulation. And if no fluid by mouth is available advanced degrees of dehydration may occur, becoming more and more pronounced the longer the delay between wounding and receiving treatment. It is for this reason that the giving of fluid by mouth is such an important part of the treatment of battle casualties. Not only does such fluid overcome dehydration but also helps the patient to restore his own blood-volume efficiently and quickly.

(B) *Psychogenic and Neurogenic*.

Emotion, fear and pain are known to influence cardiac action and to produce fainting or syncope, brief or prolonged. The patient may exhibit alarming signs of cardiac embarrassment including a low blood-pressure and the peripheral signs of sweating, pallor, cyanosis and coldness. This may occur with or without definite bodily injury. The state, in its pure form, usually responds to conservative measures which include relief of pain, reassurance, warming up and the administration of hot stimulating drinks; when it occurs in combination with definite injury the amount of collapse due to nervous influence cannot be assessed in advance; it is only revealed when conservative treatment alone produces an obvious improvement in condition. No casualty, in whom the nature of the wounds is such that he obviously falls into the first category (blood-volume reduction), should be treated for prolonged periods with conservative measures only in the hope of achieving a result. It is therefore important to examine all patients thoroughly in order to be aware of the nature and extent of the injuries before attributing their symptoms to neurogenic causes alone.

(C) *Toxæmia*.

During the war 1914–1918, it was found that casualties admitted with an established gas gangrene infection often exhibited circulatory embarrass-

ment or collapse. The removal of an infected limb would sometimes cause such symptoms to disappear. This again is a feature more commonly found in battle casualties than in those quickly evacuated from an air raid. The surgical treatment of infected cases should not therefore be delayed longer than possible.

(D) *Fat Embolism.*

This phenomenon which has been rediscovered as the result of the many bony injuries of total war is associated with general collapse, apathetic, delirious or comatose mental state and sweating. Unlike the conditions described above, the blood-pressure is usually well maintained. But unless this important observation is made the clinical state is not readily differentiated from that of other causes of collapse. The importance of bearing fat embolism in mind is that it is usually made worse by transfusion.

FACTORS WHICH MAY CONTRIBUTE TO CIRCULATORY COLLAPSE
IN THE INJURED.

It may be accepted that blood-volume reduction, whether from blood loss or plasma loss or both, is by far the commonest cause of progressive circulatory embarrassment in the injured.

Nevertheless there are a number of factors, briefly summarized below, which are known to have or thought to have a bearing on the problem of shock. Some of these operate as part of the vicious circle of progressive circulatory collapse whereas others are believed to come into play in special types of injury.

Anoxia.—One of the symptoms of an embarrassed circulation is cyanosis and anoxia may therefore be regarded as part of the vicious circle of events that finally leads to death. Though anoxia does not cause shock, its relief may considerably assist recovery. It is known also that an unskilfully-administered anæsthetic may rapidly cause circulatory collapse. There is no special virtue in gas and oxygen anæsthetic unless it is skilfully given.

Pain.—This factor undoubtedly contributes to circulatory collapse and continuous bombardment of the nervous system by nociceptive impulses is regarded by some as one of the fundamental factors in producing a state of shock. In practice the prevention of the pain factor is accomplished by the administration of morphia and occasionally by judicious local anæsthesia. A spinal anæsthetic is considered to be dangerous.

Cold.—Continuous exposure to cold has long been recognized as a contributory factor. Hence the importance of facilities for warming patients. At the same time overheating is deleterious and must be avoided.

Adrenal Factors.—Certain experimental results indicate that adrenal cortical-extracts may be useful in the treatment of shock but the evidence is by no means convincing and in the present state of knowledge the administration of these extracts must be regarded as purely experimental.

RECEPTION OF CASUALTIES.

Experience on active service and at home has shown the importance of resuscitation work and made it quite clear that the work needs to be carried out as a separate department with its own premises, specially allotted, and highly-trained staff, and with its own equipment as distinct from that of the rest of the hospital. The senior medical officer should be a physician of experience with junior officers adept at transfusion and nurses or orderlies familiar with all the simple apparatus used. All the staff should be thoroughly drilled in procedure including work under adverse conditions of emergency heating or lighting. Apparatus is required for the giving of transfusions, together with an adequate stock of blood, plasma or serum, and saline, as well as stands for the suspension of the transfusion bottles, simple surgical instruments for cutting down and inserting a cannula, facilities for administering oxygen, arresting hæmorrhage, making warm drinks, warming blankets, and drugs for the relief of pain and treatment of collapse. There needs to be a plentiful supply of cuffs for a blood-pressure apparatus so that a cuff can be left in position on a patient for several observations without disturbance. If these are provided one recording instrument will serve for many beds.

On reception, all cases, except chest or head injuries, should be placed in the head low position between blankets already warmed and the clothes be removed with scissors. Common sense will dictate whether a case is better left on a stretcher for a time or whether an immediate move into bed is justifiable. In the former case the stretcher should be placed on the bed. Manipulation, movement and disturbance must be reduced to a minimum.

ASSESSMENT.

The first requirement is to make a clinical estimate of the state of the patient and to sort out, as far as possible, those who fall into the neurogenic and psychogenic class, with little or no bodily injury, from those who, from the nature of their wounds, have obviously suffered a definite reduction in blood-volume either from blood loss or plasma loss. One has to consider the possibility of complicating factors such as dehydration, toxæmia or fat embolism, and to judge whether anoxia or other symptoms are contributing to the distressed state. Having made these estimations, reasonable treatment can be prescribed. For making this assessment it has been found that the amount of sweating, coldness or pain is not a reliable quantitative guide to the severity of the case, whilst the mental state may be definitely misleading. Those at the point of death may be acutely alert and rational. The pulse-rate too has not always been found to increase in proportion to the severity of the state and, though it may be accepted that the more severe cases have usually a rapid pulse, this feature may be entirely misleading especially if divorced from the blood-pressure reading. The volume of the pulse is more reliable than the rate. Pallor is of importance. It not only suggests blood loss but in rapidly evacuated cases gives some idea of

the amount of compensatory vasoconstriction in response to blood-volume loss, which compensation in some cases, especially the young, may be sufficient to maintain a reasonable blood-pressure.

The blood-pressure itself, not so much a single reading as serial ones at ten to fifteen minute intervals, may be regarded as the one really reliable measurable clinical observation for making a reasonable quantitative assessment. A low blood-pressure or a blood-pressure which continues to fall despite conservative treatment is always a serious sign. A relatively high blood-pressure is not always a favourable one ; the observation needs to be correlated with the nature and extent of the injuries. If the blood-pressure appears to be unexpectedly high, in relation to the probable amount of blood lost, some of the optimistic reading needs to be discounted. Unexpectedly high blood-pressure may be found in hypertensive subjects and in young subjects still in the stage of reasonably efficient compensatory vasoconstriction. If neglected or treated merely with conservative measures sudden collapse is usual.

It is therefore very essential to have full knowledge of the nature and extent of the injuries in order that these may be correlated with the other clinical observations and enter into the complete estimate. This knowledge must be obtained with the minimum of disturbance and manipulation. One of the most important items of equipment is a large pair of carpet-fitter's scissors with which clothes can be ruthlessly and completely removed without disturbance.

TREATMENT.

Relief of pain with morphia, warming with hot blankets and bottles or cradles, administration of fluid by mouth, preferably warm drinks such as hot coffee, all of which can with advantage contain a pinch of salt, should be a routine, with the exception of abdominal wounds from whom fluids should be withheld.

Sympathy and encouragement to all patients is important. All who are judged to have suffered significant blood-volume reduction, whether this be shown by low blood-pressure or by common-sense deduction from the nature of the wounds, should be transfused without delay. Transfusion raises such questions as choice of fluid, amount to be transfused and the rate at which it is to be given.

Choice of Fluid for Transfusions.—On first principles those who have lost blood require blood, those who have lost plasma require plasma and those who are dehydrated require saline. But treatment is greatly influenced by the supplies available. Blood, being a perishable fluid, is not always ready in large amount at the right time and in the right place, whereas stocks of durable protein-containing transfusion fluids—plasma or serum in fluid or dried form—can be accumulated anywhere without waste. Furthermore the primary object of the transfusion is to restore blood-volume with a fluid which will remain in the circulation and this is far more

vital than the restoration of the lost oxygen carrying power. Plasma or serum is therefore suitable, in the absence of blood, for the restoration of blood-volume due to frank hæmorrhage, but it is an advantage, when the transfusion needs to be large, if blood is available, for at least one pint in three to be blood, so that some part of the oxygen carrying power can be restored. On the other hand when blood-volume reduction is due to plasma loss it is physiological to replace with plasma, whereas blood, in that the corpuscular content adds to the viscosity of the circulating fluid, is contra-indicated. Saline or glucose being non-protein fluids, are not suitable for blood-volume restoration in that the effect lasts only for the short time which the fluid is retained in the circulation. Furthermore if given in large amount they produce pulmonary œdema. Administration of saline or glucose-saline should be restricted entirely to those judged to be suffering from dehydration, as shown by dry mouth, scanty urine, desiccated appearance, long delay between wounding and reception. In these the effect of saline is remarkably beneficial. Every pint of saline should be alternated or mixed with a pint of 5 per cent glucose.

Amount to Transfuse.—The object of the transfusion is to make an approximately quantitative replacement of the protein fluid lost and the amount should theoretically be controlled by a blood-volume determination. Cases which have been especially investigated from this scientific aspect (Kekwick, Maycock, Marriott and Whitby, 1941) have shown that a reasonable clinical guide to the sufficiency of a transfusion is the effect on the blood-pressure and that a rise of 10 to 20 mm. Hg can be anticipated for every pint transfused. When the anticipated rise does not occur continued or renewed bleeding should be suspected. It can therefore be estimated that a casualty with an initial blood-pressure of 50 mm. Hg will probably require three or four pints to restore the blood-pressure to a point sufficiently high to enable him to withstand operation. It may be assumed also that any wounded person whose blood-pressure is persistently below 100 mm. Hg will never be harmed by the administration of one or two pints.

Rate of Transfusion.—Transfusion in the injured can be practised at a much greater speed than is usual in ordinary medical practice, for it may be assumed that prior to wounding the heart muscle was in a healthy condition and that the rational procedure is to replace the acute blood loss as quickly as possible. The early stages of a transfusion may therefore be conducted at the rate of a pint in ten minutes until the blood-pressure is in the region of 90 to 100 mm. Hg, when the rate should be halved or quartered and afterwards adjusted according to progress. In some patients, however, a fast rate is not well tolerated and this may be shown by the occurrence of rigors. In such cases a slowing of the rate is almost instantly effective.

Maintenance of Condition.—Resuscitation does not necessarily end in the ward. A patient may deteriorate rapidly as the result of delay or in the operating theatre itself because of the movement on to the table, the anæsthetic, further loss of blood or the surgical procedure itself. It is as well

therefore for the last bottle set up in the ward to be administered at slow drip rate so that this accompanies the patient to the theatre and be speeded up should there be any falling off in the general condition.

Oxygen Administration.—Cyanosed patients are made more comfortable by the administration of oxygen which is especially useful in cases of chest wounds. The administration needs to be in high concentration and for practical purposes the B.L.B. mask is the only really efficient apparatus. Oxygen should be regarded as an adjunct for use in selected cases.

EXPERIMENT ASPECT.

The foregoing straightforward opinions and recommendations are based on a vast amount of experimental work and a more limited number of clinical observations on the human subject. The following is a very brief critical review of some of the more important work.

Blood-Volume Reduction.—Keith (1919) during his studies on the wounded in the last war conclusively demonstrated that diminution of the circulating blood volume was the cardinal pathological change in those exhibiting the symptoms of shock; his observations have been confirmed experimentally by many workers.

Gasser, Erlanger and Meek (1919) state that the blood-volume is diminished in animals, no matter what method is used to produce shock.

The most obvious cause of a lowered blood-volume is *hæmorrhage*, either external or internal. But a diminished blood-volume is found also in cases of severe shock in which blood loss has not been large enough to explain the state of the patient. *Hæmorrhagic shock* and shock without great loss of blood are in many ways similar and the effect of even slight *hæmorrhage* in increasing the state of shock emphasizes the relationship between the reduction of blood-volume by *hæmorrhage* alone and reduction by some other condition (Roome, Keith and Phemister, 1933). Shock and *hæmorrhage* have been differentiated by the observations that in the former *hæmoconcentration* is a feature and in the latter dilution occurs (Moon and Kennedy, 1932). It has also been argued that in shock there is congestion of the visceral blood-vessels, accompanied by *œdema* and *petechial hæmorrhages*, while in *hæmorrhage* autopsy reveals an *anæmic* condition of the tissues. This broad distinction between *hæmorrhagic* and *traumatic shock* is probably unjustified for, experimentally, Parsons and Phemister (1930) produced *traumatic shock* in dogs in which *hæmoconcentration* was rarely observed and Blalock (1934) showed that maintenance of a low-blood-pressure for several hours by continued small *hæmorrhages* caused changes in the tissues resembling those described above as following shock. More recently Dunphy, Gibson and Keeley (1941) have stated that the post-mortem microscopical changes in animals succumbing within a few hours from thermal and mechanical trauma showed no evidence of capillary damage and closely resembled the changes following acute *hæmorrhage*;

after a longer period (six to twelve hours), however, there was histological evidence of capillary damage and loss of fluid into the viscera. The available evidence suggests that the early morphological findings in shock and hæmorrhage are in some respects similar and that later in both conditions there is damage to the small blood-vessels.

Loss of red blood cells is less important than the diminution of blood-volume in causing the harmful effects of hæmorrhage for Peyton Rous and Wilson (1918) showed that rabbits could be deprived of 75 to 80 per cent of their circulating hæmoglobin without suffering great harm provided the blood-volume was maintained.

To explain the observed diminution of blood-volume in cases of shock, in which hæmorrhage has not been great, is difficult. With few exceptions these cases have all suffered severe injury involving the destruction of relatively large amounts of tissue.

Traumatic Toxæmia.—The general impression given by the work of the M.R.C. Special Shock Committee during the last war was that gross tissue injury, especially of muscle, was attended by the formation, in the damaged tissue, of a toxin or toxins which was washed into the general circulation and caused circulatory collapse. The experimental work of Dale, Laidlaw and Richards on histamine, briefly described in Special Report Series No. 26, 1919, lent strong support to this conception, for injections of sufficient histamine into a cat were shown to cause an arteriolar constriction, loss of tone and abnormal permeability of the capillaries, hæmoconcentration, a diminution in blood-volume and finally death. The blood had passed out of currency and stagnated in the dilated capillary bed; in addition plasma was lost through the capillary walls. It was stressed that histamine poisoning in an anæsthetized animal and shock in a wounded man resembled one another and that this similarity suggested that the phenomena of shock might be due to toxic substances formed in injured tissue. The identity of the two conditions was never claimed.

The experiments of Cannon and Bayliss (Special Reports Series No. 26, 1919) led them to conclude that the collapse of the circulation was caused by poisonous substances formed in the injured tissue. Later workers have failed to demonstrate satisfactorily the presence of any toxic substances. Among them, Dragstedt and Mead (1937) state that they failed to find any vasodepressor toxin in the blood and lymph of dogs during experimental shock. Rose and Browne (1940) pointed out that in patients with shock, the total blood histamine was lower in the severer cases, and suggested that this decrease might be due to fixation of the substance in the gastrointestinal tract or injured tissue. Although there is no evidence satisfactorily demonstrating the presence of toxic substances it cannot be denied that they may play some part in shock.

Fluid Loss at the Site of Injury.—About 1930 much work began to appear in America which tended to show that it was unnecessary to assume that a toxic substance was formed in injured tissue and that much of the experi-

mental work adduced in favour of traumatic toxæmia could not be repeated successfully.

Cannon and Bayliss had shown that if the blood supply to a traumatized limb were occluded, the blood-pressure did not fall and shock did not develop. If the circulation were restored the blood-pressure started at once to decline and shock developed. The same investigators removed the injured limb and compared its weight with that of its intact fellow and concluded that the increase in weight of the injured limb (which was due to extravasated blood and plasma) was insufficient to account for the death of the animal. Cannon and Bayliss also showed that preliminary denervation of the injured limb did not prevent the onset of shock.

Blalock (1930) and Parsons and Phemister (1930) produced shock in dogs by traumatizing one hind limb. They found on comparing the weights of the injured and intact extremities that the increase in weight of the injured leg, which was assumed to be due to loss of blood and plasma from the circulation, amounted in most instances to about half the calculated blood-volume. The method of estimation of weight of the limbs employed by Cannon was criticized on the grounds that it took no account of the swelling in the loose inguinal and retroperitoneal tissues, which was usually found when the thigh was injured. Blalock therefore amputated the hind extremities through mid-abdomen, and then bisected the hind quarters by sawing up the spinal column. Parsons and Phemister, however, excised the limbs by severing symmetrically the tissues attached to the innominate bones. In spite of this difference in technique both found that there was sufficient loss of blood and plasma into the injured part to account for the fall in blood-pressure. No evidence of toxic substances in the blood returning from the injured limb was found. Cannon and Bayliss apparently did not attempt to produce shock in animals after occluding only the venous return from the injured leg. Blalock showed that when such a procedure was carried out, shock could still be produced; he observed also that on releasing the venous obstruction the slope of the blood-pressure fall became less steep, instead of more precipitate as one would expect if the blood were carrying poisonous substances into the general circulation. Parsons and Phemister state that if the venous drainage of the injured limb is obstructed the shock develops more rapidly and is of a severer degree than when the veins are patent.

Blalock and Parsons and Phemister attempted to demonstrate the presence of toxins in the blood returning from the limb by introducing it in various ways into normal animals and animals whose condition had been weakened by hæmorrhage. The experiments met with no success.

Blalock and his associates in later papers showed that in mild trauma of the extremities sufficient fluid is lost at the site of the injury to explain the lowered blood-pressure and further that this fluid analytically closely resembles plasma. It was also shown by Johnson and Blalock (1931) that the loss of plasma is more deleterious than the loss of whole blood or red blood cells alone.

That local fluid loss plays an outstandingly important part in causing the development of shock is now generally recognized. That it alone is responsible is probably untrue and other factors must be considered. Some of these formerly occupied the position now held by local fluid loss and were considered the prime cause of shock. Now they are regarded as secondary factors of varying importance.

Nervous Factors.—The nervous exhaustion theory of the origin of shock was the leading theory up to the time of the last war, when it was superseded by the theory of traumatic toxæmia. In 1935 new evidence in favour of this theory was produced by O'Shaughnessy and Slome. They first performed experiments to see if they could demonstrate a toxin and failed. They next investigated the amount of fluid loss occurring at the site of injury and concluded that it was insufficient alone to explain the state of shock and that other factors must be considered. They found that they could produce shock by traumatizing a limb which was connected to the body by the nerves alone and which was nourished by an artificial circulation from a second cat. The injured animal died, but the results of the experiment were complicated by the death of the donor cat. They also showed that the elimination of nervous impulses by (1) nerve section, (2) spinal cord section, and (3) spinal anæsthesia, prevented the development of shock. From their results they concluded that local fluid loss and nociceptive nervous impulses are both important ætiological agents. While not attempting to dogmatize on their relative importance, they personally believed that the nociceptive impulses were of greater importance than the local fluid loss. No attempt was made to explain how the nociceptive impulses caused the circulatory collapse. Attempts were soon made to repeat this work. Bell, Clark and Cuthbertson (1938), Blalock and Cressman (1939) failed to obtain the same results. The latter group of workers found that if they used choralose as the anæsthetic, which was used by O'Shaughnessy and Slome, they could obtain evidence showing that nociceptive impulses were of importance but under no other experimental conditions. Louber, Kabat and Welte (1940), however, satisfied themselves that they could reproduce O'Shaughnessy and Slome's experiments.

Adrenal Medulla.—Porter (1907), Seelig and Lyon (1909) all contended that vasoconstriction was a feature of shock and that a peripheral vasodilatation due to collapse of the vasoconstrictor system through exhaustion did not occur save perhaps terminally. Porter was able to show experimentally that the vasomotor centre was active in shock. Recently the role of the adrenal medulla has been re-emphasized, particularly by Freeman (1935). It is well known that the adrenal medulla is activated by pain, cold, anxiety, all states likely to be present in shock. It has been shown experimentally that the infusion of adrenalin in suitable amounts will cause an oligæmia, extrusion of plasma, a low blood-pressure and hæmorrhages in various tissues. The blood-volume has been shown to decrease by as much as 27 per cent. The explanation of the role of the

adrenal medulla is that the sympatho-adrenal activity tends to ensure the blood supply to the vital centres at the expense of a generalized vasoconstriction, especially in the skin and splanchnic area, which causes eventually stasis of blood in the capillaries, increased permeability of the capillary walls and loss of plasma. Cannon (1934) has also pointed out that over-activity of the sympathetic nervous system and excessive secretion of adrenalin may lead to dilatation of the small vessels in muscles and the consequent passage of fluid into the tissue spaces. Normally in active muscle this fluid would pass into the lymphatics but, in the shocked patient, this pumping action of the muscles is lacking. In contrast to this evidence in favour of the possibility of the adrenal medulla being active in shock, Davis (1937) produced shock by hæmorrhage, trauma, and the injection of adrenalin and histamine. He found that the tissue changes produced by adrenalin did not resemble those caused by hæmorrhage or trauma and concluded that they lent no support to the theory that the adrenal medulla was active in shock. Similarly Hamlin and Gregerson (1939) were unable to show in unanæsthetized animals that adrenalin caused a diminution in blood-volume.

While there is evidence for both sides, it seems most probable that the adrenal medulla together with the sympathetic nervous system is active in shock. The importance of this activity is difficult to assess. One should probably regard it as an accompaniment of the shocked state.

Adrenal Cortex.—The similarity between shock produced by mechanical trauma and the condition which follows bilateral adrenalectomy is striking. That there may be a relative deficiency in the elaboration of the cortical hormone in shock has been an attractive theory, since lack of this principle causes amongst other things a hyporolæmia with hæmoconcentration and increased viscosity, increased pulse rate and an increased sensitiveness to hæmorrhage and trauma. Swingle and his collaborators from their work on trauma (of intestines and muscle) in adrenalectomized animals were led to conclude that the capillary atony caused by the lack of cortical hormone increased the permeability of the capillaries and they observed that infusions of saline were ineffective in raising the blood-pressure unless cortical extract was administered simultaneously. They also observed that the cortical hormone itself had a blood-pressure raising effect. Weil and Browne (1940) found that there is an increased excretion of cortin in the urine after surgical operations; this observation may be connected with the earlier findings of Selye (1937) that exposure of animals to various damaging agents is accompanied by a hypertrophy of the adrenal cortex. The changes in the cortex found by Selye occur in a comparatively short time after injury but there do not appear to have been any similar observations in human beings dying of shock. These observations would indicate that one of the body's reactions to an injurious stimulus is an increased activity of the adrenal cortex, and that the need for the cortical principle is in some way increased. However, the finding of an increased urinary excretion of cortin

in human beings would suggest that excess amounts are being produced or that there is a diminished utilization or destruction.

It is difficult to reconcile these findings and to knit them into a satisfactory exposition of the role of the adrenal gland. Certain experimental results, however, indicate that adrenal cortical principles may be useful in the treatment of shock but the evidence is in no way conclusive.

Heuer and Andrus (1934) produced a fall in blood-pressure by injecting aqueous extracts of the contents of loops of bowel which had been obstructed and they observed that the immediate injection of cortical extract prolonged the life of the animal and tended to prevent the fall in blood-pressure and the loss of plasma from the vessels which occurred in the absence of this treatment. Selye and Dosne (1940) produced shock in rats by injuring the thigh muscles and manipulating the intestines. The survival period of the group injected with corticosterone was significantly longer than that of the untreated group. Desoxycorticosterone and extracts of adrenal cortex were ineffective. Selye, Dosne, Bassett and Walker (1940) found that not only was desoxycorticosterone ineffective but actually harmful in the treatment of their animals. Cortical principles have also been claimed to be helpful in the treatment of burns in which the blood sodium is lowered.

It is not possible at present to assess the usefulness of cortical preparations in the treatment of shock or the part played by the adrenal cortex in producing the state of shock. The present evidence would indicate that such preparations may be found to be useful in selected cases.

This short survey of some of the literature is not intended to be a comprehensive review. Its purpose is to touch upon some of the more important aspects of the experimental work on shock and to give an idea of the many-sided character of the condition without undue emphasis upon any single feature.

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FURTHER OBSERVATIONS ON SALMONELLA FLAGELLAR ANTIGENS.

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THE suggestion was made in an earlier communication (Archer 1938) that the early, and incorrect, acceptance of certain organisms of the *Salmonella* Group as monophasic in the group phase was due to the recessive nature of the specific antigen in such organisms. Further, it was suggested, that the more common occurrence of the specific phase of diphasic organisms is due to the fact that it is usually the *group* antigen which is recessive; and finally that the failure of either a "pure" group or a "pure" specific suspension to produce, when used as an antigen, a correspondingly pure group or specific antibody, is due to the presence of organisms in the recessive phase in the inoculum rather than to the presence of both group and specific antigens in any individual bacterial cell.

The object of this further communication is to record later observations which, while affording additional evidence in favour of the theory of the dominant and recessive character of antigens and of the persistence of recessive forms in cultures of the dominant phase, have *also* furnished data which strongly suggest that both group and specific antigens *may* occur in the same bacterial cell (for convenience the term "hybrid" will be used to designate such group-specific organisms) and to discuss, in the light of these observations the morphological basis of group and specific variation.

I.

FLAGELLAR STRUCTURE AND DIPHASIC VARIATION.

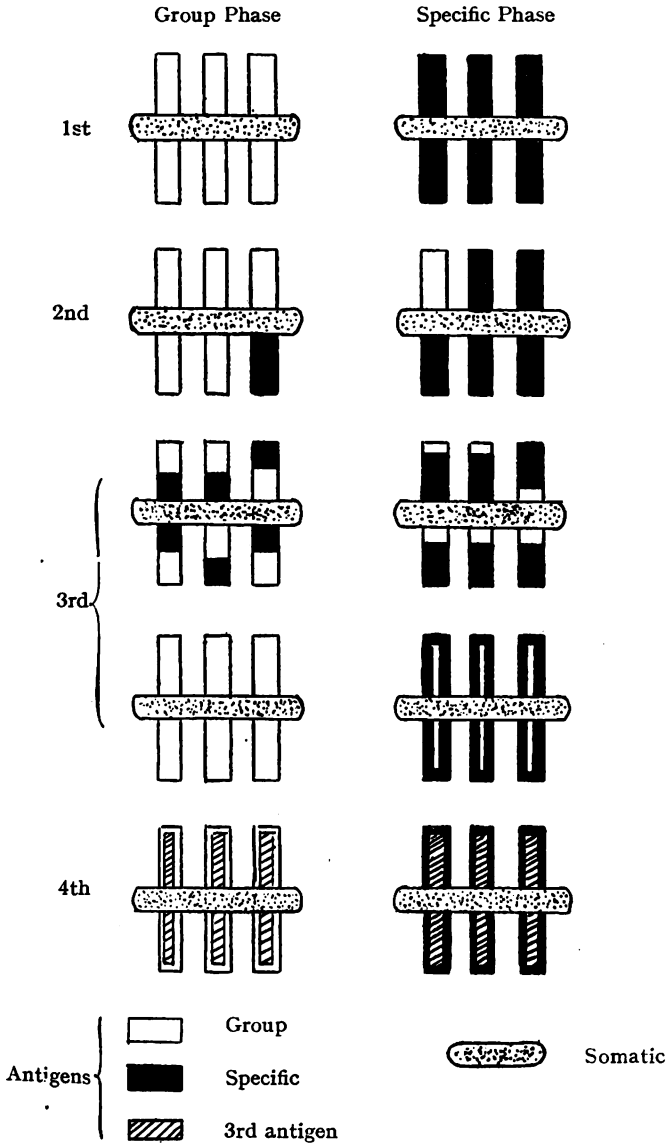
It may fairly be suggested that four possible variations in the arrangement and structure of the flagella may determine the H antigen pattern of diphasic *Salmonella* organisms:

1. "Simple" flagella may exist which contain only group or specific antigens; and it may *also* be essential that all the flagella on individual organisms are in the same phase.
2. "Simple" flagella only may exist but it may be possible for individual organisms to be provided with flagella in different phases.
3. The flagella may be "compound" possessing both the specific and group antigens (*a*) both as surface antigens, or (*b*) having one as the outer covering of the core formed by the other.
4. The flagella may be "compound" possessing either group or specific antigens together with a basic antigen common to the species and related to the other H antigens somewhat as "R" antigens are related to smooth somatic antigens.

These four hypotheses are diagrammatically illustrated by fig. 1.

The First Hypothesis.

The truth of the first hypothesis, in conjunction with the theory of dominance and the persistence of organisms in the recessive phase, was



suggested by earlier observations and evidence both confirming this and refuting the third hypothesis can be obtained from the further experiments described below :

(a) *Experiments with Bact. paratyphosum B (Price).*

Two special suspensions for use as inoculums for immunizing rabbits were prepared and used as described :

Inoculum 1.—A suspension of *Bact. paratyphosum B* (Price) which behaved as a specific reagent *in vitro* was grown in *Bact. paratyphosum C*-serum-broth of high group titre to reduce the number of organisms present in the recessive group phase. Subculture into another tube of the same serum-broth was carried out on two successive occasions. The culture thus obtained failed to show "H" agglutination, i.e. was apparently an "O" culture. This suspension was formolized and a rabbit was injected intravenously with three doses at intervals.

The resulting "H" titres were :

<i>Bact. paratyphosum B</i> (specific)	1/5,000
Binns	1/40
Kunzendorf	1/80

Inoculum 2.—The same specific culture of *Bact. paratyphosum B* (Price) referred to above was transferred from *Bact. paratyphosum C*-serum-broth to a plate of soft agar also containing *Bact. paratyphosum C* serum to reduce the number of organisms in the recessive group phase while also diminishing the liability to "O" variation such as occurred in the first inoculum (Archer, 1941). Spreading growth occurred and a subculture was made from the edge of the growth to a similar plate. Each plate was subcultured to broth. Both the resultant broth cultures when tested showed specific "H" agglutination and did not react with Kunzendorf serum. These two cultures were mixed, formolized, and used as the inoculum for a fresh rabbit. Table I shows the immunological response elicited and, in contrast, the effect produced in another animal by the use of inoculums of *Bact. paratyphosum B* which had not been submitted to the action of group serum.

TABLE I.—GROUP AND SPECIFIC TITRES OF SERUMS PRODUCED BY THE INJECTION OF DIFFERENT INOCULUMS.

The following abbreviations are used in the tables and text :

Name of Organism	Abbreviation
<i>Bact. typhi murium</i> var. binns	Binns.
<i>Bact. thompson</i> var. berlin	Berlin.
<i>Bact. cholerae suis</i> var. kunzendorf	Kunzendorf.
<i>Bact. newport</i> var. puerto-rico	N.P.R.

SUSPENSIONS						
"Specific" inoculum	Rabbit	No. of injections	<i>Bact. paratyphosum B</i> (specific)	Kunzendorf	Binns	N.P.R.
<i>Bact. paratyphosum B</i>	13/40	3	1/80,000	0	0	0
"Inoculum 2"	13/40	5	1/40,000	1/160	—	1/320
<i>Bact. paratyphosum B</i> (Price)	91/39	4	1/80,000+	1/3,200	1/1,600	1/3,200
		11	1/80,000	1/3,200	1/3,200	—

0 = <1/40

(b) *Experiments with Bact. paratyphosum C (Hirschfeld).*

A specific culture of *Bact. paratyphosum C* which showed no group agglutination with Binns or Kunzendorf serums was inoculated into a tube

of *Bact. paratyphosum* B-serum-broth which had a high group titre. Growth occurred in the form of turbidity and a deposit. The turbid supernatant fluid was examined, found to be pure specific, and subcultured to a similar tube of *Bact. paratyphosum* B-serum-broth. Second and third serial subcultures were made. The supernatant portion of each of these cultures was found on examination to react *in vitro* as a pure specific suspension. That from the third subculture was used to immunize a rabbit, the result, together with the contrasting response produced by inoculums not passaged in a medium containing group serum is shown in Table II.

TABLE II.—GROUP AND SPECIFIC TITRES OF SERUMS PRODUCED BY THE INJECTION OF DIFFERENT INOCULUMS.

" Specific " inoculum	Rabbit	No. of injections	<i>Bact. paratypho-</i> <i>sum C (specific)</i>	SUSPENSIONS		
				Kunzendorf	Binns	Berlin
<i>Bact. paratyphosum</i> C	9/40	3	1/16,000	1/160	0	—
Third subculture in group-serum broth	9/40	5	1/40,000	1/20,000*	0	0*
<i>Bact. paratyphosum</i> C	4/40	4	1/20,000	1/320	—	1/320
	4/40	10	1/16,000	1/3,200	1/400	—
<i>Bact. paratyphosum</i> C	16/36	5†	1/500	1/250	0	—

* = Group formula of both Kunzendorf and Berlin is 1.5. . . . (1.3.4.5). Comment on this anomalous result is made later.

† = Examined after 2 years.

(c) *Experiment with Bact. typhi murium.*

This organism was also grown in *Bact. paratyphosum* B-serum-broth (the serum used being similar to that present in the cultures of *Bact. paratyphosum* C described above). Results obtained by the use of the specific culture produced as an inoculum are shown (with controls) in Table III.

TABLE III.—GROUP AND SPECIFIC TITRES OF SERUMS PRODUCED BY THE INJECTION OF DIFFERENT INOCULUMS.

" Specific " inoculum	Rabbit	No. of injections	<i>Bact. typhi</i> <i>murium (specific)</i>	SUSPENSIONS		
				Kunzendorf	Binns	N.P.R.
<i>Bact. typhi murium</i>	10/40	3	1/50,000	0	1/3,200	—
subcultured in		3 (later bleed)	1/50,000	0	1/1,600tr.	—
group-serum-broth		5	1/80,000	0	1/640+	0*
		5 (later bleed)	1/20,000	0	1/1,600*	0*
<i>Bact. typhi murium</i>	94/39	10	1/64,000	1/25,600	1/25,600+	
<i>Bact. typhi murium</i>	32/36	7	1/50,000	1/10,000	1/50,000	—

* The group formula of both Binns and N.P.R. is 12 (1.2.3).

These results show a similar anomaly to that noted in Table II.

(d) A suspension of Binns, consisting of the supernatant portion of a subculture of this variant in *Bact. stanley* broth from a culture in soft agar containing *Bact. stanley* serum, gave rise on injection into a rabbit to the production of a specific titre of 1/5,000 and a group titre of 1/125 tr—.

Conclusion.—All these results demonstrate that, by growing a diphasic organism in the presence of group serum, a suspension may be obtained

which behaves as an almost pure specific antigen *in vivo* even when, as in the last experiment, the initial culture is a group variant. This finding accords with the hypothesis of recessive group antigens the organisms bearing which can be deposited, and so separated out when group serum is used in the medium in which the culture is grown, leaving in the supernatant fluid a much more purely specific culture than an ordinary culture in which the recessive group organisms are still present. On the other hand these results are *not* such as might be expected if "hybrid" group-specific organisms bearing "compound" flagella exist in accordance with the *third hypothesis*. In such a case the intravenous injection of flagellate diphasic organisms might be expected to produce reactions comparable to those which have been shown by Boyd (1938) to be produced by organisms having group and specific *somatic* antigens, namely the Flexner group of bacteria with respect to which he has demonstrated that specific strains almost always produce high group titres on injection so that pure specific serums can only be produced by absorption.

The Second Hypothesis.

The second hypothesis however is *not* excluded by the evidence already considered and, since various observations show that the existence of "hybrid" organisms can hardly be denied, some examples of such observations are given and will be examined with reference to this hypothesis.

OBSERVATIONS WHICH SUGGEST THAT "HYBRIDS" BETWEEN PURE GROUP AND PURE SPECIFIC ORGANISMS DO OCCUR.

(a) *Agglutination Results.*

In my previous paper I implied that suspensions which were not pure group or specific but mixed showed partial or incomplete agglutination with both group and specific serums rather than complete agglutination with either or both, suggesting that they were composed of *mixtures* of organisms in the group with others in the specific phase rather than being *homogenous* with the individual organisms containing both group and specific antigens, since, if this were the case, agglutination might be expected to be complete.

Further observations have not invariably strengthened this implication. Agglutination of mixed group and specific suspensions is *not always* only partial with each serum. Some examples of such observations are given below :

(1) A culture of *Bact. thompson* var. *berlin* in a soft agar-broth "U" tube produced a suspension which showed *complete* agglutination to titre with Kunzendorf serum and *partial* agglutination to 5 per cent of the specific titre (equal however to *twenty times* the group titre) of a *Bact. thompson* serum.

(2) A culture of *Bact. newport* var. *puerto-rico* in a "U" tube containing soft agar and *Bact. typhi murium* var. *binns*-serum-broth was subcultured on a plate and four colonies from the plate inoculated into four tubes of broth. Broth No. 2 produced a specific culture. The other three broth

cultures, on titration with a *Bact. newport* specific serum having a titre of $<1/25$ for *Bact. morbificans bovis* (group), Binns, and *Bact. stanley* (group), gave complete agglutination to 20 per cent of the titre for Broth No. 2 (equal however to 100 per cent of the titre for a standard suspension of *Bact. newport* with an apparently different content of the *specific factors* e.h.) but were also agglutinated by Kunzendorf and *Bact. stanley* serums. (The latter it may be noted has no common "O" factors with *Bact. newport*.)

(3) Four suspensions of *Bact. paratyphosum* C were completely agglutinated by both *Bact. paratyphosum* C specific serum and Binns serum, though the group agglutination only occurred to a small fraction of the titre of the serum (the end-point of the specific agglutination was not estimated).

(4) In the course of the examination of several strains of *Bact. paratyphosum* B it was noted that, whereas several cultures were either almost pure specific or pure group and others showed obviously *partial* or *incomplete* agglutination with both group and specific serums, *one* culture of *Bact. paratyphosum* B (Cross) was apparently completely agglutinated by both specific and group serums.

Thus in four instances agglutination which was *not* partial (i.e. complementary) in each case was produced by the action of both group and specific agglutinins.

(b) Culture in Group Serum Broth.

Evidence of a rather more definite nature, also leading to the conclusion that "hybrid" organisms occur, was afforded by the behaviour of certain strains of *Bact. paratyphosum* B in cultures containing group antibodies:

A specific inoculum of *Bact. paratyphosum* B (Price) grew in *Bact. paratyphosum* C (group)-serum-broth as an almost complete deposit with a few floccules in the supernatant fluid. A subculture was made to a tube of the same medium and again growth consisted of a deposit. Further serial subcultures showed some turbidity but this was shown to be due to the development of the "O" variant. (This observation was actually made during the first experiment recorded in this paper the *final* result of which furnished evidence in favour of the *first* hypothesis!) The experiment was repeated with four strains of *Bact. paratyphosum* B, strains "Price," "Baker," "Rowlands," and "Cross." Examination of preliminary broth cultures showed that four of six "Price" cultures and two of three "Cross" cultures were specific. All of three cultures each of "Baker" and "Rowlands" were found to be group. Specific cultures of "Price" and "Cross" and cultures of "Baker" and "Rowlands" were inoculated into *Bact. paratyphosum* C (group)-serum-broth. No turbidity developed in the original cultures or in repeated subcultures of "Baker" or "Rowlands" while such as was produced in the cultures of "Price" and "Cross" was due to the production of the "O" variant.

Soft agar was inoculated from the supernatant portion of such cultures of "Baker," "Rowlands" and "Cross" and from a broth subculture of

the supernatant fluid of a similar culture of "Price." "Baker" produced a mixed group and specific growth (in this case agglutination *was* partial with each serum), "Rowlands" a predominantly group culture, "Cross" a predominantly specific culture, and "Price" a specific culture.

DISCUSSION.

It has been shown above that cultures of *Bact. paratyphosum* B strains "Price" and "Cross" in group-serum-broth fail to produce specific growth with turbidity.

On the other hand when such cultures were subcultured in soft agar specific suspensions were obtained.

This is an example of the agglutination of all motile forms *growing* in group serums, followed by the failure of group serum to agglutinate a subculture grown away from its action.

Such behaviour is difficult to explain but it might be due to the presence of scanty group flagella on organisms the flagella of which are predominantly specific.

Such scanty flagella might be sufficient to cause a failure of the organisms to separate after division in the presence of group antibodies while being at the same time too few to cause agglutination once separation has occurred.

An attempt was made to test this concept by washing such agglutinated deposits of *Bact. paratyphosum* B and resuspending them for titration with group and specific serums. The attempt failed as resuspension was not successful and auto-agglutination occurred.

The presence of higher proportions of group flagella might give rise to the type of result reported under "agglutination results," the organisms being agglutinated to a high percentage of the titre of the serum homologous to the more numerous flagella but to only a low percentage of the titre of that homologous to the more scanty flagella.

The findings marked with an asterisk in Tables II and III however and the failure of a *Bact. newport* serum to agglutinate Binns, *Bact. stanley* (group) and *Bact. morbificans bovis* (group) while having a titre of 1·125 tr. for *Bact. newport* (group), are more difficult to interpret since the application of this second hypothesis to the findings in Tables II and III with the assumption that the Kunzendorf and Binns suspensions used had a minority of specific flagella, leaves the absence of any approach to a constant ratio between the figures in column 4 (full specific titres) and those in columns 5 and 6 in Tables II and III respectively (titres due, on this hypothesis, to the minority flagella) unexplained.

The Third Hypothesis.

The existence of flagella bearing both group and specific surface antigens is rendered almost inconceivable by the ready manner in which suspensions which react with serums as either purely group or specific can be obtained.

The conception of compound flagella in which the specific antigens are the outer covering of the core formed by the group antigens, the relationship being thus similar in respect of flagellar antigen to the $S_{\rightarrow} \rightarrow R$ relationship in respect of somatic antigens, receives a little support from the fact that there is evidence suggesting that group variation is in the nature of a degenerative change, though it has been demonstrated that in the case of *Bact. paratyphosum* B this change is not associated with any loss of virulence. Nevertheless, for the reason already stated in a review of the evidence in favour of the first hypothesis, I do not think that the third hypothesis in either form is acceptable.

The Fourth Hypothesis.

The hypotheses considered so far have failed to provide adequate explanation of the peculiar results noted in Tables II and III, and of the reactions exhibited by the *Bact. newport* serum referred to above, namely the marked difference in agglutinability as recorded in each table of two group suspensions, having the same formula although variants of different species, with the same serum.

A possible explanation of these anomalies is that they merely represent an extreme example of quantitative differences of group antigen components as illustrated in a previous paper (Archer, 1938), where it is demonstrated for instance that three different *Bact. paratyphosum* B serums showed the presence of group antibody 1 in the relative proportions 1 : 20 : 8 probably indicating an even wider divergence in the proportions of antigen 1 in the suspensions used as inoculums. If this be the true explanation however the occurrence of this difference favouring, *in each of the three species*, the agglutination of the homologous rather than the heterologous group variant seems a remarkable coincidence. (Table II shows that it is the homologous group variant Kunzendorf—homologous in the sense that it is a variant from the specific "C"—rather than the heterologous Berlin—a variant from the specific "K"—which shows the quantitative balance of the antigens 1.3.4.5. permitting agglutination by a serum which does not agglutinate the other organism having, on this assumption, some other quantitative balance of these same antigens. A similar conclusion follows an examination of the other series of findings referred to.)

These difficulties lead to the consideration of the fourth hypothesis which presumes the presence of a third flagellar antigen. The third antigen to accord with the findings would appear to form the core to an outer covering of either group or specific antigen and to be more or less unmasked according as this outer covering were more or less complete. In this respect the relationship would therefore, with respect to flagellar antigen, resemble that of rough to smooth somatic antigen. Unlike the rough somatic antigen, however, the third antigen would appear to be species specific. The hypothesis outlined above obviously affords an explanation of the findings so far inadequately accounted for.

The experiments recorded with the Binns and Kunzendorf suspensions could be explained by the unmasking to a considerable extent of such a third antigen.

The acceptance of the existence of such a third antigen dispenses with the compulsion to assume the existence of "hybrid" group-specific organisms and so displaces the second hypothesis since the phenomena which have led to such an assumption might equally be produced by group or specific cultures in which the third antigen is more or less masked.

No direct evidence of such a third antigen has been observed or reported however. The β specific phase may be the homologue of such an antigen in the *monophasic* organisms in which alone it has been described though with few exceptions this antigen is identical for most species rather than species specific. The matter requires much further investigation with absorption of group and specific factors from such sera as are partially analysed in Tables II and III to establish or refute this fourth hypothesis.

PRACTICAL APPLICATION OF THE OBSERVATIONS RECORDED IN THIS PAPER.

The practical application of the findings recorded above consists in the observation of certain precautions in the preparation of reagents for agglutination tests.

(1) The occurrence, in culture of diphasic organisms, of recessive antigens in the contrary phase indicates the advisability of culturing such organisms in the presence of group serum for the production of inoculums to be used for the preparation of specific serums. This method of culture will usually be effective and is simpler than the subsequent absorption of group agglutinins which will often otherwise be necessary.

(2) The same phenomenon, since it gives rise to the frequent failure to produce pure group serum, suggests that the homologous group serum should never be used (unless it has been carefully freed from specific agglutinins by absorption) to test the specificity of colonies of the diphasic *Salmonella* organisms by slide agglutination. Similarly the considerable quantitative variation of group agglutinins in different serums incidental upon a corresponding variation in group antigen components in different strains (Archer, 1938) suggests that a serum containing as nearly as possible the correct antibodies for the group phase of the organism under investigation (and not merely the universal antibody 1) should be used. Thus, for example, when testing cultures of *Bact. typhi murium* for their group or specific qualities neither Binns serum nor Kunzendorf serum, but N.P.R. serum should be used. Binns serum is not suitable since the presence of antibodies to the recessive specific antigen *i* may give rise to the false interpretation of specific colonies as group. Kunzendorf serum is also unsuitable since it contains the group antibodies 1.5 (whereas the group phase of *Bact. typhi murium* contains the antigens 1.2) so that it may, by variation in

antigen or antibody 1 content, give rise to the false interpretation of group colonies as specific. In contrast N.P.R. serum containing heterologous "O" antibodies, heterologous specific antibodies, and the homologous group antibodies 1.2 avoids such sources of error.

SUMMARY.

The antigenic structure of the flagella of diphasic *Salmonella* organisms is discussed and the evidence as regards the presence of group and specific antibodies in the same flagellum, the uniformity of the flagella on individual organisms and the possibility of a third flagellar antigen in the diphasic *Salmonella* species, is considered while a further line of investigation is indicated.

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A FEW ELEMENTARY REMARKS ON HEAT STROKE.

BY MAJOR J. MACKAY-DICK, M.B., CH.B., M.R.C.P. EDIN.

Royal Army Medical Corps.

I AM prompted to write a few notes on heat stroke because, in my experience, there is a great deal of ignorance as regards the most obvious ætiological factors, prophylaxis, early recognition and treatment of this condition.

Normally in healthy individuals it matters not whether they live in a very cold climate or in a hot climate because, through the heat regulating centre, which balances heat loss and heat production, the average body temperature remains at, or about, 98.4° F. Now to those of us who live in a temperate climate there is no difficulty in keeping our body temperature at, or about, 98.4° F. We take no special precautions to ensure this because we are natives of that climate and we naturally keep ourselves warm by our native diet, dress and exercise. In such a climate, during the greater part of the year, we are concerned with the conservation of heat and we find no real difficulty in doing this, having done it automatically for a large number of years.

However in a hot climate, especially if the humidity is relatively high, we find a complete reversal in the state of affairs to which we are accustomed in a temperate climate. We are newcomers to a hot climate where it is common for the temperature to be well above the average body temperature. We are accustomed to drinking really large quantities of bland fluids and many individuals (essentially the troops and especially those in isolated areas) do not worry unduly if their bowels miss a day or two—some do not worry if their bowels are not opened for four or five days or even longer. In such a climate we are especially concerned with heat loss and the various methods of regulating this successfully. We therefore facilitate heat loss by the use of suitable clothing and by not over-exerting ourselves. We especially facilitate heat loss by (a) encouraging the free action of the skin in sweating. To make up for the fluid loss and chloride loss, and to keep up this action, we greatly increase our fluid intake and also (or we ought to) increase our intake of common salt. Deficiency of salt intake is characterized by lack of energy, lassitude, undue exhaustion, mental irritability, hypopieses, tachycardia and general malaise. It does not appear to be realized by many that, if we do not increase our salt intake, in a hot climate, at the same time as we greatly increase our fluid intake, we will sweat profusely and rapidly and wonder why the great increase of fluid intake has produced so little relief. However if the salt intake is also increased it is found that, although we have to increase greatly our fluid intake in a hot climate, marked benefit is obtained by ingesting fluid in quantities smaller

than those which produce so little benefit when the intake of salt is low.
(b) Ensuring a good easy bowel action once daily at least.

In addition we keep ourselves fit by judicious exercises at the appropriate time of the day and time of the year. We avoid alcoholic excess by restricting the consumption of alcohol either by complete abstinence or by not drinking alcoholic liquors until sundown and then, usually, we should not make a habit of having more than two or three drinks each evening.

Now if in individuals there is not a fine balance between heat loss and heat production, and should the latter gain the ascendancy, then the internal body temperature rises and continues to rise in no uncertain fashion until hyperpyrexia and the other signs and symptoms of heat hyperpyrexia appear. There is no doubt that constipation, injudicious consumption of alcohol and the inadequate intake of bland fluids and common salt, impose an excessive strain on the heat regulating mechanism when the humidity is high or in a very hot climate where the humidity is relatively high. It is my belief that if such individuals suffer an elevation of temperature from any cause, especially from one of those conditions characterized by rigors, where there is a sudden and dramatic rise in the internal body temperature such as occurs characteristically during the rigor stage of malaria, then this increase in internal body temperature is such that the already sorely tried heat regulating mechanism cannot cope with it and it fails. As a result the temperature shoots up with dramatic suddenness to 106° F.—107° F. or even higher. The patient rapidly develops the other signs and symptoms of heat hyperpyrexia (heat stroke), and in a relatively short space of time he becomes comatose. Unless such cases are properly and adequately treated by all appropriate measures, for heat stroke as well as the emergency treatment for malaria if that condition be also present or even suspected, then there will be a relatively high mortality.

There is one rule which should be adopted by all medical officers in very hot climates with a relatively raised humidity or where the humidity is high, namely "Regard all febrile cases admitted to hospital as potential cases of heat stroke and carry out prophylactic treatment as well as the treatment for the condition from which the patient is suffering." If this is done zealously by all Orderly Medical Officers and Nursing Sisters then no cases of heat hyperpyrexia should develop or, anyway, reach maturity in hospital. This suggested rule may appear to be extreme but it will be recognized as a very sound one by all medical officers who have really seen and treated true cases of heat hyperpyrexia. It is my opinion that heat hyperpyrexia is the cause, in a very large percentage of cases, of the continuation of fever which is seen in many cases of malaria *under adequate quinine* therapy.

Such cases of malaria are frequently mentioned in hushed voices and how often have I heard the remark "You have a very severe (or resistant) type of malaria in such and such a district." I believe that if in addition to adequate treatment for malaria such patients are given an enema on admis

sion to hospital as well as fluids *ad lib.*, calomel grs. iii followed by salts, tepid sponged frequently and nursed under a fan from the moment they are admitted to hospital then prolonged fever in adequately treated cases of malaria *will not* occur. There is no doubt in my mind that the prolonged fever in such cases is not really due to malarial infection but is due to unrecognized and untreated incipient heat stroke which has been precipitated in a patient so predisposed.

Another type of case, the true nature of which is not infrequently missed in the early stages, is the individual who is admitted to hospital with low fever, vague pains in the loins and/or lower abdomen, slight dysuria and with a few pus cells in the urine. He is usually treated primarily as a case of urinary infection. Soon after admission or on the next day his temperature shoots up to 106° F. or thereabouts and it is finally recognized that he is now a definite case of heat hyperpyrexia.

Why are such cases of incipient heat hyperpyrexia frequently missed on first admission to hospital? The answer is that it is not sufficiently recognized (a) that it is common to find pus cells in the urine of individuals (Europeans) living in a very hot climate and who drink insufficient quantities of bland fluids; and (b) that the other signs and symptoms presented by such patients are also characteristic of the incipient case of heat hyperpyrexia.

I would commend the following suggestions to all medical officers newcomers to Africa or similar climates.

(1) In the very hot weather regard all febrile cases admitted to hospital as candidates for heat stroke and institute all measures for the prevention of the development of this condition. This includes the adequate treatment of the condition primarily responsible for the patient reporting sick.

(2) In all cases showing fever of any type, even when the cause may appear to be obvious, never forget that the patient may also have malaria. In addition if any febrile condition is not responding as well to your treatment as it should then consider malaria. If you can find no evidence of the latter condition then the mere fact that the patient may have been exposed to malarial infection some time in his career is sufficient justification for the exhibition of quinine in adequate doses.

(3) Advise all personnel in your unit on the potential danger of consuming liquor before sundown and of alcoholic excess.

(4) Avoid constipation in your unit and see to it that everyone gets as much fluid as possible.

In addition I would suggest that the extra salt ration should be given in the form of salted nuts.

ACKNOWLEDGMENT.

Major-General P. S. Tomlinson, D.S.O., M.R.C.P., D.M.S., Middle East, for permission to forward these notes for publication.

PLAN OF A TENTED FIELD OPERATING THEATRE AS USED BY THE 18TH GENERAL HOSPITAL AND SUGGESTED MODIFICATIONS

By MAJOR H. S. SHUCKSMITH, B.Sc., M.B., CH.B., F.R.C.S.

Royal Army Medical Corps.

THE theatre, which was constructed in the Spring of 1940, was situated on sandy soil at Etaples. It was rendered almost dust-proof by double tentage and a lining of bed sheets which could easily be changed. It was a windy area and to prevent sand being blown about when the patients were admitted the entrance was made 12 feet in length to allow closure of the porch flaps with the stretcher in the entrance before admission to the theatre.

The whole floor space from the office of the Officer i/c Surgical Division, which was also the surgeons' changing room, and including the sterilization and blood transfusion tent, had a good smooth concrete floor with gullies at the edge for drainage. A wall of sandbags protected the theatre block.

The theatre tent, consisting of four sections and two ends, was divided by wooden uprights and skeleton framing for bed sheets to make four separate theatres. These theatres could be considered as two units, each consisting of a large theatre 18 by 11 feet, and a smaller one 14 by 9 feet. The almost central entrance and corridors made through traffic in the theatres unnecessary and added greatly to the cleanliness, quiet and separation of each team.

This separation of the main theatre tent into separate units is emphasized as the valuable feature in this plan. The corridor to the single sterilizing room was, however, for busy times, rather narrow, being only 3 feet wide. In the sterilizing room, which consisted of two sections and two ends, corrugated iron sheeting replaced the tent wall behind the "Man-love" sterilizers. The condensed steam from these Manloves was used to heat a 40-gallon drum of water to 200° F. This gave us a good supply of warm water. Boiling water for general purposes was provided by an ingenious device. A "Tommy boiler, water, copper, 5 gallons," which could not be kept boiling by Primus stoves underneath it, could be kept boiling by one Primus stove when water heated in a biscuit tin was syphoned off continuously into it. Also included in this outfit was a brick gallery for heating pans over Primus stoves. Any device to use to advantage the relatively small number of Primus stoves which are supplied is of the greatest value. The six fish kettles heated by spirit lamps for the sterilization of instruments were grouped together in the sterilizing room. Two ward sinks were fixed 4 feet apart and formed a support for an intervening

table. Two pack store racks furnished useful storage for the sterilized drums.

The instruments were arranged in separate drums into five basic dissecting sets. The extras for two abdominal, two cranial and one chest set were kept separately. The fracture instruments, pins and drills and saws, were kept in Dettol on the upper and stirrups on the lower shelf of one of the instrument tables.

In theatre No. 2 there was a supply of sized Thomas splints and, as three operating tables only were available, the table for this theatre was a simple wooden trestle bench. A Bohler distraction apparatus was supplied

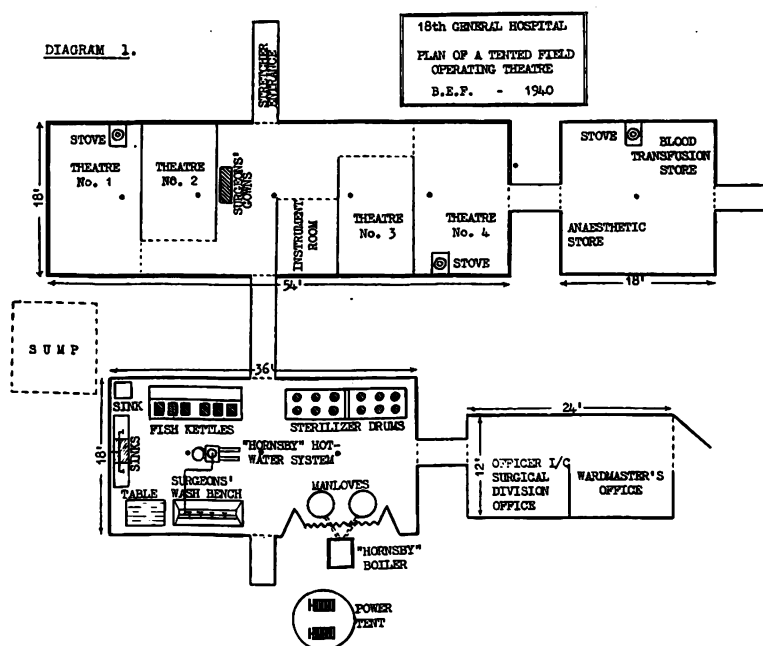


DIAGRAM 1.

in each theatre. A plaster table was constructed to be moved to any theatre as required.

The many different appliances for taking and giving blood were sterilized and stored together under the charge of a Blood Transfusion Officer. It was envisaged that all blood would be taken here (from our own donors) and, although some might be given here, the main place for infusion would be in the theatres or the resuscitation ward which was nearby.

Excellent lighting was supplied from the two emergency 100 volt. 40 kw. generators. Four 40 watt lamps suspended from a simple wooden frame gave a good light in the smaller theatres and in the larger theatres six 40 watt lamps fitted in a tin canopy gave a most satisfactory illumination.

It is important to remember the tremendous heat generated by these lamps when a canopy is made with a wooden framework.

The generous supply of tentage and the concreting of this large area was obtained through the personal interest of the Commanding Officer who, with Lieutenant-Colonel A. B. Pain, R.A.M.C., was responsible for the basic layout.

An invaluable craftsman materialized in the person of Serjeant D. Hornsby, R.A.M.C., who planned and made the apparatus to use the condensed steam to obtain warm water and constant boiling water in the adapted "Tommy" boiler. He also made the canopies for the theatre lighting.

The internal design of this theatre was based on the idea that at certain

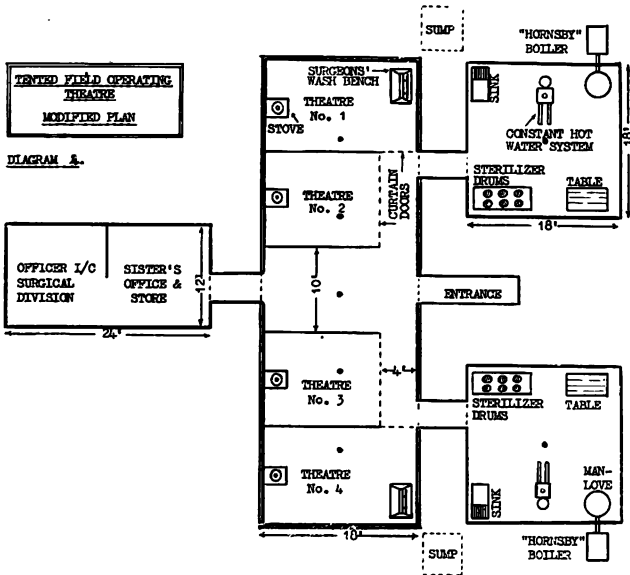


DIAGRAM 2.

periods so many cases would need operations of either a minor or major surgical importance at the same time that four separate theatres would be useful. Further reflection on the theatre organization and particularly discussion with Lieutenant-Colonel W. E. M. Mitchell, M.C., R.A.M.C., has led me to modify the original plan. It has been proved by experience that cases can be most expeditiously treated if one surgeon has two theatres with assistants rather than each theatre working simultaneously.

Diagram 2 represents a complete tented theatre unit with the basic feature of two theatres connected with a sterilizing room. For this scheme less tentage is required than for Diagram 1 and this in itself is a very important item. It will be seen that in the middle of the theatre tent a large space is available opposite the Sister's Office and Storeroom for the accom-

modation of patients who are admitted through an entrance well protected by the sterilizing tents on each side.

The theatres consist of two larger 18 by 11 feet and two smaller 14 by 11 feet. A surgeon's wash basin is provided in the corridor portion of each larger theatre and this will be found very convenient for the surgeons who wash between each case. Each theatre would have its own fish kettle rather than having them grouped together in a somewhat distant sterilizing room. This will make each theatre more and more an independent unit.

The sterilizing room consists of two ends 18 by 18 feet and in addition to the sink, table and drum rack, could contain one "Manlove" sterilizer also heating the "Hornsby" boiler and one "Hornsby" boiling water device.

In this way it is thought the best use of the excellent equipment provided in the field can be made.

My thanks are due to my Commanding Officer, Colonel F. Whalley, *D.S.O., T.D., K.H.P.*, for his suggestion and permission to publish this article ; also to my colleagues, particularly Major J. M. P. Clark, *R.A.M.C.*, and to Lance-Serjeant G. A. Bramley, *R.A.M.C.*, for his excellent diagrams.

NOTES ON LEECH INFECTION IN THE MIDDLE EAST.

BY CAPTAIN BRIAN REEVES, F.R.C.S.ED.

Royal Army Medical Corps.

SINCE time immemorial the leech has been a source of trouble to the population in the Middle East and the symptoms caused are well recognized.

Gideon was wise to the potential danger of the leech when he chose his army of 300 men—"So he brought down the people unto the water : and the Lord said unto Gideon, Everyone that lappeth of the water with his tongue as a dog lappeth, him shalt thou set by himself ; likewise everyone that boweth down upon his knees to drink.

And the number of them that lapped, putting their hand to their mouth, were three hundred men, but all the rest of the people bowed down upon their knees to drink water."

Several species of leech are found in Palestine and N. Africa, *Limnatis nilotica* being the most common. Drinking water from wells is a source of infection. The young leeches are only 3 mm. long. They attach themselves to the mucosa of the mouth, nose, larynx or trachea, remaining and growing there until they cause symptoms. They may cause headache and obstinate epistaxis resulting in severe and fatal anæmia. Sometimes the bite becomes infected and an ulcer is formed.

In *Hirudinæ* there are three semi-circular jaws having from 50 to 100 sharp teeth. The salivary glands are situated inside the mouth cavity, and secrete fluid preventing coagulation of blood. When the leech becomes detached from the mucosa the wound continues to bleed because the effect of the salivary secretion in retarding coagulation is of some duration.

We learn that the *Limnatis nilotica* is a source of trouble to the French troops in Algeria. Napoleon's Army in its retreat through the Sinai Peninsula was also inconvenienced by the leech. Several cases of leech infection were observed in British Troops in Egypt and Palestine in the last war.

It is for these reasons that the report on two cases may be of interest to medical officers serving in the Middle East at the present time, especially those "in the field."

Both patients were adult Arabs from Northern Palestine. They complained of "something moving in the throat," making them cough. They were both aware of the nature of the foreign body. They were accustomed to drinking well water.

Attempts at removal had been made by the patients themselves with their own fingers. Removal with forceps by means of indirect laryngoscopy had also failed.

The patients were shown to me at this stage. Both were coughing and

salivating freely, the saliva being blood-stained. Both were hoarse but not unduly distressed.

Indirect laryngoscopy revealed a blood-stained œdematous larynx with injected vocal cords. Nothing else was visible on inspiration. At the end of expiration a small shiny brown body presented itself between the cords. This was the unattached end of the leech which was blown out of the trachea by the expired air. It was sucked in again during inspiration and disappeared from view. Diagnosis, leech in trachea.

In both patients leeches were removed by direct laryngoscopy under general anæsthesia. Ether vapour appeared to have no effect on the leeches which were grasped with Patterson forceps. Considerable force was required to remove them from the mucosa. There was no undue bleeding from the trachea after removal.

The leeches were alive and undamaged, they measured 1.5 cm. and 3.5 cm., after being killed in 10 per cent formalin in normal saline.

If local anæsthesia be used (cocaine spray and laryngeal syringe) with the patient in the sitting position, a bronchoscope should be ready for immediate use in case the leech becomes detached and falls down the trachea or into a bronchus.

Even using a general anæsthetic it is reassuring to know that a bronchoscope is available.

SUMMARY.

- (1) Notes on leech infection of historical interest.
 - (2) Source and manner of infection and symptoms which may be caused.
 - (3) Report of two cases of leeches in the trachea, presenting with cough and hæmoptysis.
 - (4) Advisability of having a bronchoscope available during removal of leeches from the trachea.
-

Editorial.

PENICILLIN.

AFTER reading the very valuable paper by H. W. Florey and a group of Oxford workers in the *Lancet* of August 16, 1941, in which was described a method of extraction of penicillin from culture, a method of assay, the characteristics of the anti-bacterial action and a number of other qualities, we thought it as well, in the interests of history, to turn back, once more, to the original paper by Fleming in 1929 after his discovery of the mould then thought to be *Penicillium rubrum*, but now known as *Penicillium notatum*. "While working with staphylococcus variants," says Fleming, "a number of culture plates were set aside on the laboratory bench and

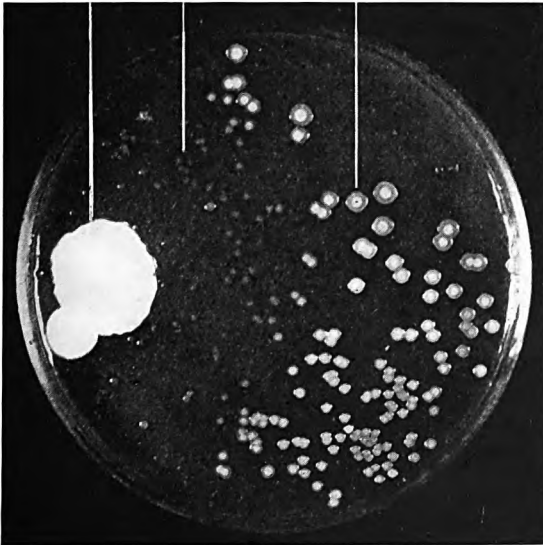


FIG. 1.—Fleming's original plate. Around a large colony of a contaminating mould the staphylococcus colonies became transparent.

By courtesy of H. K. Lewis & Co.

examined from time to time. In the examinations these plates were necessarily exposed to the air and they became contaminated with various micro-organisms. It was noticed that around a large colony of a contaminating mould the staphylococcus colonies became transparent and were obviously undergoing lysis" (fig. 1).

The mould is the penicillium which is now used to produce its anti-bacterial extract and which will, doubtless, be very largely employed for this purpose in the future if some other creature is not discovered to produce still more anti-bacterial poison on a more easily exploited scale.

With this mould at his disposal, Fleming began an intensive study of it from every point of view and, more particularly, from the direction of its anti-bacterial power. It is quite extraordinary what a generous contribution he made to a comparatively unknown field of bacteriology in the course of this investigation. A number of other moulds were examined for their power to inhibit the growth of bacteria but none was found to share this quality to an appreciable extent, not even other varieties of penicillium itself. He described "the simplest method of examining for inhibitory power," by cutting a furrow in an agar plate and filling in with a mixture of

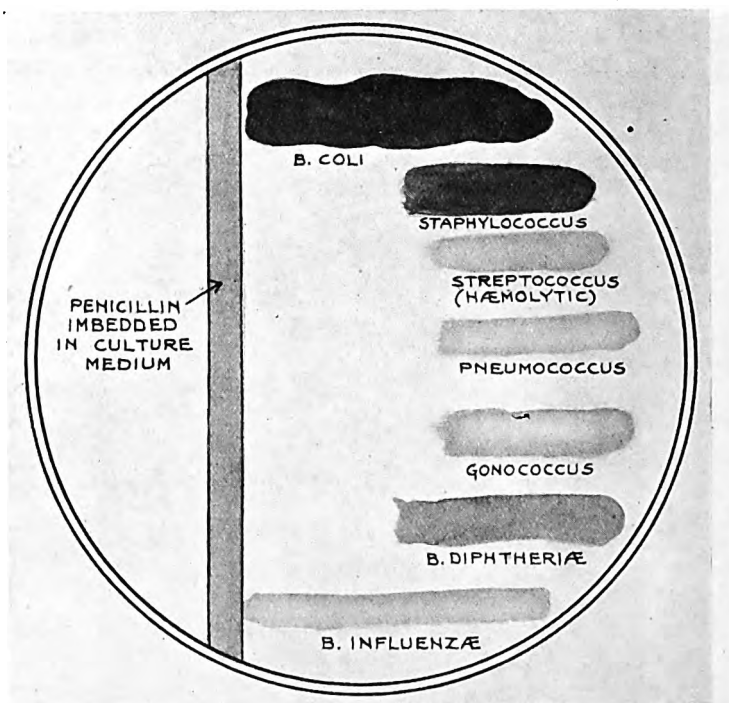


FIG. 2.—Specific bacteriostatic qualities of the *Penicillium* for certain organisms and not for others.

By courtesy of H. K. Lewis & Co.

equal parts of agar and the broth in which the mould has grown. "When this has solidified, cultures of various microbes can be streaked at right angles from the furrow to the edge of the plate." We re-publish above a picture from the original article in which this technique was illustrated. It will be noticed that Fleming had already discovered the specific bacteriostatic qualities of his penicillium and was demonstrating by this means the inhibitory power of his culture for staphylococcus, *Streptococcus hæmolyticus*, pneumococcus, gonococcus and *B. diphtheriæ* and its complete want of inhibitory action against *B. coli* and *B. influenzae* (fig. 2). It may be added that he

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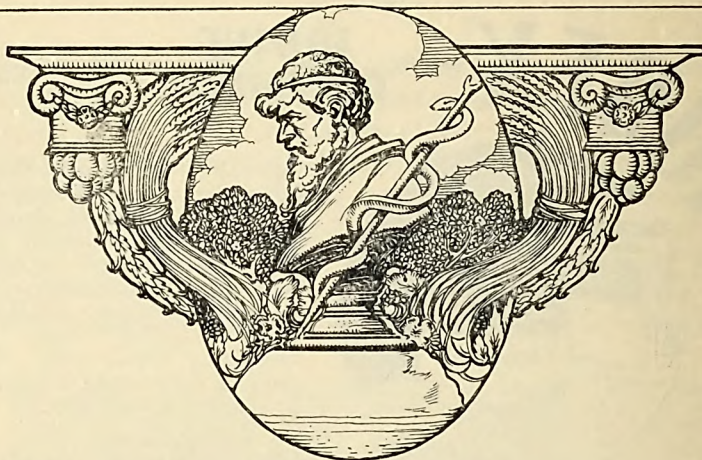
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also described how to accurately titrate a broth culture by making serial dilutions, "and then implanting all the tubes with the same volume of a bacterial suspension and incubating them."

Fleming also called attention to the effects of heat; that one hour at boiling point reduces the anti-bacterial substance to less than one quarter if the fluid is alkaline but much less so if the fluid is neutral or slightly acid, and "that autoclaving for twenty minutes at 115° C. practically destroys it." He found that filtration through a Seitz filter failed to diminish the anti-bacterial power (though it is now pointed out that some diminution may result from this procedure); that the active principle is freely soluble in water and weak saline solution; that, evaporated at low temperature to a sticky mass, it can be completely extracted by alcohol but that it is insoluble in ether or chloroform. He noted that 20° C. was a suitable temperature for growth, that cultures failed at 37° C., and that the formation of anti-bacterial substance was progressive for about eight or ten days after which it fell, being practically gone after fourteen days. He found that penicillin belongs to the group of slow-acting antiseptics and that staphylococci are only completely killed after an interval of over four and a half hours. With regard to its toxicity he showed that it was practically non-toxic for laboratory animals and that it had no more toxicity to leucocytes than had the broth in which the mould was grown. Fleming pointed out in his first publication that "it can be applied to an infected surface undiluted as it is non-irritant and non-toxic. If applied therefore on a dressing it will still be effective even when diluted 800 times which is more than can be said of the chemical antiseptics in use. Experiments in connexion with its value in the treatment of pyogenic infections are in progress." In his summary, too, he speaks of its probable clinical application; "It is suggested that it may be an efficient antiseptic for application to or injection into areas infected with penicillin-sensitive microbes." He tried his anti-bacterial substance in treatment to a limited extent and with some success. The difficulty, as he says, is the instability of the active principle which will not keep in watery solution, but he has used the substance regularly up to the present time in the differential culture of influenza bacilli and other insensitive germs. Clutterbuck and Raistrick in 1930 confirmed Fleming's findings and introduced a modification of a well-known medium for growing moulds in which Fleming's penicillium produced a good yield of penicillin.

The matter rested for some years and more recently Professor Florey and his team of collaborators have taken over the work. In their paper in the *Lancet* they examine the question anew and describe their findings. "Penicillin," they say, "can be extracted by ether, amyl acetate and certain other organic solvents from an aqueous solution whose pH has been adjusted to 2. From the organic solvent the penicillin may be extracted by shaking with phosphate buffer or with water the pH of which is kept at 6-7. Penicillin is quickly destroyed at pH 2 at room temperature so the first extraction must be carried out rapidly or at low

temperature. Once it has been extracted into solvent the penicillin is stable for some days." The penicillin-containing solvent as delivered from the extraction apparatus is now treated after a manner for which the original paper must be consulted. "Finally the penicillin is extracted back into water using sodium hydroxide to adjust the pH, . . . the 'non-pyrogenic' or 'therapeutic' fraction, which contains perhaps 80 per cent of the penicillin put through the column, is extracted into pyrogen-free water, all glassware having been rinsed with the latter. It is a deep reddish-orange fluid, yellow in dilute solution, with a faint but characteristic smell and a bitter taste."

The bacteriostatic power of penicillin is found to be much greater against staphylococci and hæmolytic streptococci than that of the sulphonamides and is only influenced to a minor degree by the number of bacteria to be inhibited.

Its bacteriostatic power is not inhibited to any appreciable degree against staphylococci and streptococci by hydrolytic protein breakdown products or products of tissue autolysis or pus. "Penicillin is less toxic to leucocytes *in vitro* than the sulphonamides." As stated by Fleming, the extract is found to be harmless to living tissues in practical dilutions. "These results . . . strongly support the view that local applications of quite strong solutions should prove innocuous to tissue cells."

Experiments on the rabbit, the cat and man prove that, while the rabbit is the best able of the three to inactivate penicillin, the cat and man allow of the detection of activity in the blood and in the urine.

Finally, in five cases in humans, all of extreme gravity, the penicillin proved of sterling worth as far as supplies would allow of its use ; in a sixth it was successfully given by the mouth along with sodium bicarbonate in a case of urinary infection with staphylococci ; and in three cases of severe eye trouble, it was used with success as a local application.

Clear descriptions of the method of assay, a modification of Fleming's original method, and of the large-scale production of penicillin, are given and the details of the cases are stated with the utmost frankness and with extreme care. Professor Florey and his associates are to be congratulated on what promises to be a wonderful blessing to humanity.



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IN our issue of September, 1937, on page 213, we published a letter from Lieutenant-General Sir George MacMunn, *K.C.B.*, *K.C.S.I.*, *D.S.O.*, appealing for the Lord Roberts Memorial Workshops. We make no apology for a still further appeal in this number. Every soldier knows how essential is this kind of training or re-training. Many are deprived of the power of following their previous occupation through the loss of a limb or the loss of power. For such men, the kind of instruction given in these Workshops is imperative. Now, in a time of war, the number of men applying for re-training is naturally very great and, in the future, is certain to be greater still. It is right that we should subscribe to this wonderful work, not only out of love and respect for a great soldier gone before us but out of the wish to help those who have been or may be stricken on the field of battle. Donations should be sent to the Honorary Treasurer, Lord Roberts Memorial Workshops (Admiral of the Fleet Sir Roger Keyes, Bt.), at 122, Brompton Road, Room T, London, S.W.3.



Clinical and other Notes.

SHAFTESBURY MILITARY HOSPITAL MEDICAL SOCIETY.

HEAD INJURIES.

BY COLONEL CAIRNS.

COLONEL HUGH CAIRNS dealt first with the clinical features observed in cases of gun-shot wounds of the head and said that they differed in several respects from those following injuries by blunt objects. Unconsciousness at the moment of impact was often absent ; amongst twenty-nine cases of penetrating injury only six lost consciousness at the time. Retrograde amnesia, too, was not so frequently encountered. Delayed loss of consciousness might be due to the spread of intracranial hæmorrhage but it might sometimes be found to be due to dosage with morphia, the routine $\frac{1}{4}$ grain being too large a dose for these patients. In those cases in which consciousness had been lost, the injury had been to the base of the brain, often in the cerebellar or hypothalamic region, and this provided an interesting parallel to the experience that at operation a large amount of the cortex might be removed without unconsciousness resulting whereas effusion of blood around the brain-stem would rapidly produce this result. It was possible that the cortical activity associated with consciousness was maintained by a flow of afferent impulses by way of the thalamus and that interruption in this locality or in other parts of the brain-stem was more important than damage to the cortex.

In contrast to the small incidence of disturbances of consciousness focal signs were much more commonly seen than in the case of blunt injuries and this was the case even if the skull had not been penetrated by a projectile. These focal signs often cleared up rapidly and, in the case of a man who, immediately after injury had been completely paralysed, the use of the limbs returned within a few minutes and within a few days complete blindness had been replaced by a residual quadrantic hemianopia.

Gunshot wounds displayed a greater liability to infections of the brain even if the skull had not been opened. Wounds of the scalp especially showed this tendency and it would seem that the associated injury to the skull, even in the absence of a fracture, rendered the bone more pervious to infecting organisms, for two out of fifteen cases of scalp wounds unassociated with fracture developed intracranial abscesses.

The remarkably high incidence of epilepsy after gunshot wounds of the head had been demonstrated recently by Ascroft. Fits occurring in the first two weeks after injury were not uncommon but such fits need not be regarded as any indication that epilepsy would become established later.

The treatment of gunshot wounds of the head must be early and thorough.

In view of the dangers of infection from even a small scalp wound, these injuries must receive the utmost care. To ensure this a large area around the wound should be shaved—two sharp razors and a strop were indispensable—and the area anæsthetized by an adequate regional block. Having cleaned the wound and excised the damaged tissue, the bone should be explored and if there was any evidence of a depressed fracture one should explore between the bone and the dura to detect any in-driven fragments, making a small burr-hole through the skull if necessary. The dura should be left clean but unless it appeared purple it was not advisable to open it. The wound should be packed with a sulphanilamide paste; this was also useful if for any reason operation had to be delayed for the paste might be immediately applied to the wound and the operation safely postponed for several hours.

Regarding the treatment of blunt head injuries, if a patient was unconscious and operation was not indicated, progress depended largely upon the efficiency of the nurse; the swallowing reflexes were usually present and by constant attention adequate nourishment could be given, while, if the reflexes were lost, a stomach tube would be required and this might be left in position for a week at a time. These patients were often left completely undisturbed by the nurse but this was undesirable for the shallow breathing which resulted had been found to raise the intracranial pressure; it was better to turn the patient at intervals to ensure deeper breathing as well as to prevent bed-sores. Even for restless patients morphia was required in small doses only; gr. $\frac{1}{8}$ was sufficient in most cases, and this might be repeated after two to three hours when the effects of the previous dose had worn off. It was important in all cases to observe and record those signs which indicated the depth of unconsciousness so that any alteration might be quickly detected.

With regard to the period of recovery, it was unwise to keep a case of mild concussion too long in bed and then to expect a rapid return to normal life. A man whose unconsciousness had lasted for less than six hours might get up by stages after a week if free from headache but return to full duty should not occur until he had passed through a convalescence in which increases in activity had been carefully graded up to the final stage of violent exercise.

A SYSTEM OF SEWAGE TREATMENT APPLICABLE IN THE FIELD.

BY MAJOR G. V. JAMES,
Royal Army Medical Corps.

ARISING out of a complaint that a well used as a source of water supply by troops and inhabitants alike was polluted by a nearby deep trench latrine, the need for an improved method of sewage purification in the field was recognized.

Usually, on active service, sanitation is improvised and hence is imperfect, but a suggestion was to receive the sewage in caustic soda which was then tipped into a soakage pit or removed by trenching. This has the serious drawback that a high pH may be produced in the soil and that the subsequent purification in the ground may accordingly fail. Further, it was thought that the caustic soda might splash during use and injury to the person occur. The idea of preventing the splashing by either a layer of oil or by mechanical means was mooted.

The disadvantage of the oil layer is similar to that of the caustic soda as it will affect the biological activity of the soil by forming an impermeable oily layer over the sewage through which oxygen cannot penetrate.

The anti-splash methods introduced by Major Turner (3rd Field Hygiene Section) and the methods of separation of urine and fæces suggested by Major Greenfield (7th Field Hygiene Section) and Major Finlayson (13th Field Hygiene Section) were so good that it was decided to superimpose the chemical purification on to these systems.

The following is an account of experiments performed with the idea of improving the quality of the liquid to be discharged by use of chemicals which can be easily obtained in the field. It was of course realized that peace time standards of purity had to be scrapped and the main desideratum was to purify the sewage so that it would be less polluting should it gain access to water used for human consumption.

Urine.—The urine is separately collected in a receptacle containing lime. This lime raises the pH of the liquid to 9·5 so that bacterial decomposition in the receptacle and odour production are prevented.

An experiment was also performed using bleaching powder in the receptacle. Smell was effectively stopped and, whilst the pH was raised, urea was decomposed and the liquid was rendered less valuable as a fertilizer when applied to the soil. Further, the residual chlorine hinders bacterial action in the soil so that the use of lime is to be preferred.

The limed urine is run into a soakage pit whence it is absorbed.

Fæces.—The fæces are collected in 20 per cent caustic soda and are found to become sterile in one hour, so any purification must be by chemical processes. One point has been raised as to how long the alkali would last before replenishment is necessary. The optimum time is of course the time at which maximum digestion occurs. The following table shows that this is about six days after the last addition of fæces.

TABLE I.—RESULTS ARE P.P. 100,000 OXYGEN ABSORBED.

	Time in days after start of experiment								
	0	1	2	3	4	6	8	9	11
Permanganate absorption	80	180	280	200	230	300	200	290	310
Hypochlorite absorption	130	130	350	180	420	217	242	227	265
Ratio of hypochlorite to permanganate	1·8	1·3	1·2	1·0	1·8	7·3	11·8	8·0	8·6

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(a) For the removal of foreign bodies from the cornea : a few drops of an 0.2% solution.

(b) Prior to stitching of wounds : a swab soaked in a 1-2% solution and briefly applied to the edges of the wound will produce anaesthetic effect persisting for about one hour.

(c) For painful conditions and injury of the tongue or mouth : brief application to the wound, of a swab soaked in a 1% solution.

(d) For anal fissure, haemorrhoids, severe pruritis : application of a 2-3% ointment in lanolin.

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THE application of sulphanilamide powder to burns may assist in the prevention of sepsis. Local sulphonamide therapy should be started as soon as possible. In this way tissue destruction due to streptococcal infection, slow healing and associated contractures are prevented.

The hæmolytic streptococcus is the most common pathogen concerned in the acute infection of wounds and this organism is highly susceptible to the action of sulphonamides.

Failure of skin grafts to "take" in cases of burns has been shown to be due to hæmolytic streptococcal infection of subclinical degree. This infection may be overcome by the topical application of sulphanilamide powder enabling skin grafting to be successfully performed.

For established sepsis, treatment via the blood stream is required, using the appropriate sulphonamide administered orally or parenterally.

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The chemistry of the process deduced from the ratio (the ratio is explained elsewhere) is that the faecal proteins are degraded to simpler digestion products, but there is no advantage in prolonging the digestion more than a week.

Purification by precipitation was continued on two different specimens of liquid, one after two days standing and the other after seven days standing. The two days was tried as it may be necessary to curtail the digestion period somewhat due to enemy activity.

The liquid was diluted with water or ablution water (urine would raise the oxygen absorption too much), the optimum dilution being 1 volume of sewage and 8 volumes diluting fluid. These dilutions were then treated with ferrous sulphate and bleaching powder in various ratios so as to coagulate the suspended matter. Sedimentation proceeded for four hours.

TABLE II.—OXYGEN ABSORPTION AFTER FOUR HOURS SEDIMENTATION.

No treatment	..	..	..	..	94 p.p. 100,000
225 p.p.m. FeSO ₄ : 50 p.p.m. CaOCl	..	..	..	..	26
300	75				38
350	100				33

The most advantageous concentrations are hence 225 p.p.m. ferrous sulphate and 50 p.p.m. bleaching powder.

The bleaching powder is superior to lime as the following results show :

TABLE III.—OXYGEN ABSORPTION, COMPARISON OF COAGULANTS.

	2 days	7 days
Untreated	95 p.p. 100,000	102 p.p. 100,000
225 p.p.m. FeSO ₄ : 50 p.p.m. CaO	26	16
225 p.p.m. FeSO ₄ : 59 p.p.m. CaOCl	38	25

The suggested treatment is hence resolved to : Separation of urine and faeces, the urine being collected in receptacles containing lime and disposed of by a soakage pit.

The faeces are collected in 20 per cent caustic soda and, when collection is completed, are allowed to digest in the alkali for a week (there is no smell produced during this procedure) after which the liquid is diluted with eight times its volume of water or ablution water and treated with 225 p.p.m. ferrous sulphate (16 grains per gallon of liquid) and 50 p.p.m. bleaching powder (about 4 grains per gallon). The reagents are made into solution before adding to the sewage liquid. The whole is thoroughly agitated and then allowed to sediment in covered containers for four hours. The supernatant liquid is then removed and disposed of by a soakage pit, roofed with turf (to prevent fly nuisance), while the sludge can be dried in the air without nuisance, and either burned in an incinerator or disposed of by trenching.

It is claimed that this method will require less labour than the use of deep trench latrines. It is less polluting to water supplies and to the ground since a higher degree of purification is reached, although it is an improvised method, while the cost of chemicals is low and they are easily obtainable.

AN ALTERNATIVE TO THE CLOVE-HITCH HALTER, FOR USE WITH THE THOMAS' SPLINT.

BY LIEUTENANT G. COHDA,

Royal Army Medical Corps.

EXPERIENCE in the training of R.A.M.C. personnel in the method of application of Thomas' splint has demonstrated to me various disadvantages in the use of the clove-hitch halter for maintenance of extension as recommended in the R.A.M.C. Training Manual. I have therefore experimented with several alternatives and the one about to be described is, I think, far superior in every way.

Briefly my objections to the clove-hitch are as follows :

(1) The difficulty in the formation of the hitch encountered, in spite of prolonged instruction according to the admirably simple method described in R.A.M.C. Training Manual (para. 627 ; sub-para. 111 ; sect. (ii)). The multiplicity of methods used in the formation of the clove-hitch is testimony to this difficulty.

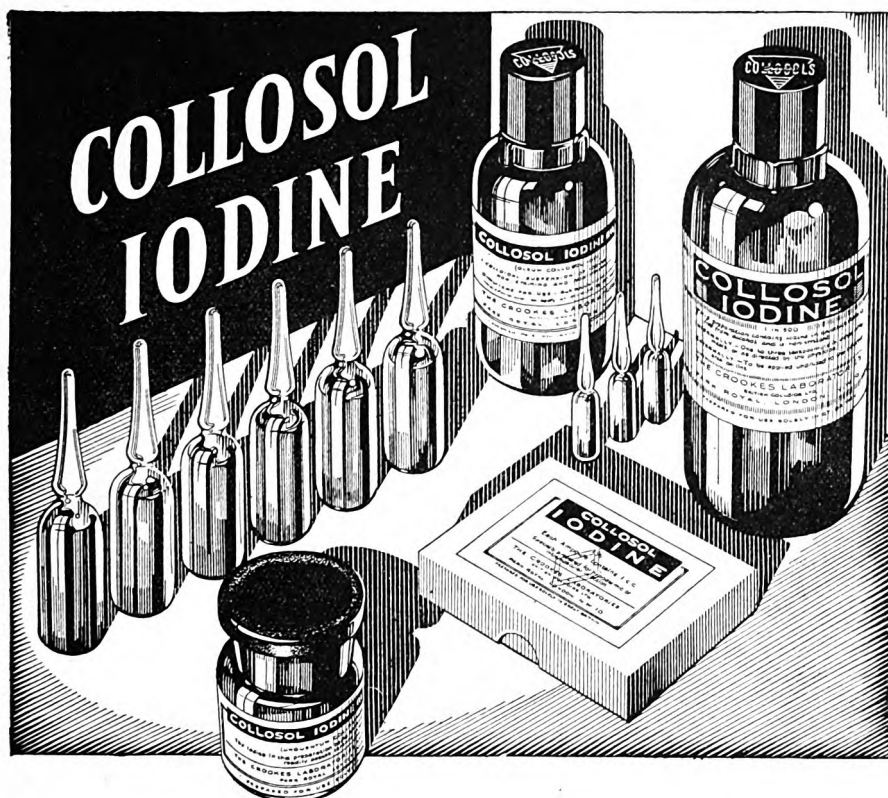
(2) The loops of the hitch are invariably either too large or, more often, too small. This necessitates re-adjustment, in the former case whilst the loops are on the boot, leading to pain and discomfort to the patient ; and in the latter case, before the loops are applied, leading to some waste of time or, as usually happens, to a re-formation of the hitch.

(3) The temporary manual extension being applied by No. 2 bearer is inevitably disturbed in order to apply the loops of the hitch. In the presence of a wet or muddy boot the re-application of the hands after the passage of the loops is often difficult and has, in my experience, led to occasional dropping of the foot with obvious result to the patient.

The above points may not seem a very formidable array at first sight and probably are not the only disadvantages of the clove-hitch but in warfare, when rapidity of treatment is almost, if not more so at times, as important as the efficiency with which it is carried out, the time lost in surmounting the above difficulties, points 1 and 2 particularly, may imperil the lives of both squad and patient. In addition the necessity under modern war conditions of carrying out most first aid manœuvres in total darkness renders imperative the use of methods which are simple and can be applied effectively and rapidly by the sense of touch alone. In my opinion, the clove-hitch does not satisfy these conditions and I have therefore adopted the following alternative method :

Stage 1.—Manual extension applied in the orthodox way by No. 2 bearer.

Stage 2.—Standing on the same side as the injured limb place a narrow fold bandage around the instep of the boot and draw both ends up close to



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the leg making sure that the inner one is at least a foot longer than the outer. Hold both ends taut with the right hand (fig. 1).

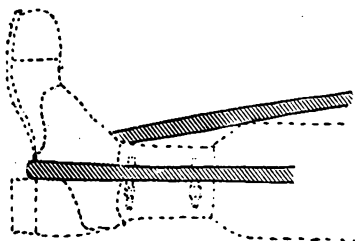


FIG. 1.

Stage 3.—With the left hand lightly grip the patient's ankle between thumb (outside) and fingers (inside) including the bandage in the grip and so anchoring it (fig. 2).

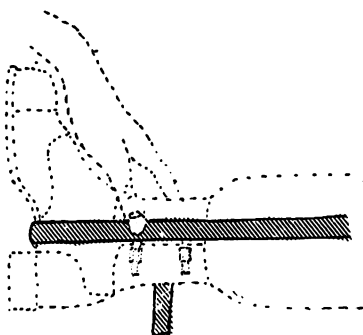


FIG. 2.

Stage 4.—The loose inner end of the bandage is then passed posteriorly round the ankle and brought up so as to encircle it and include the outer end of the bandage which is anchored by the thumb of the left hand. It is then passed over the anterior aspect of the ankle and back to its point of origin under the fingers of the left hand on the inner side of the ankle (fig. 3).

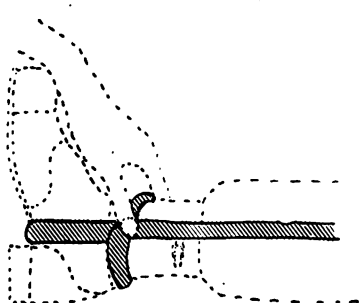


FIG. 3.

Stage 5.—Pass this end over and then under the right-angled loop formed under the anchoring fingers.

Stage 6.—Release the anchoring left hand and grasping both ends of the bandage pull downwards beyond the sole of the boot. These ends may now be fixed to the foot of the Thomas splint and a Spanish windlass applied in the same way as with the clove-hitch (fig. 4).

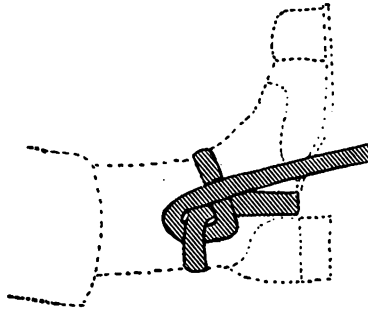


FIG. 4.

I lay no claim to originality in the formation of this "knot" as I am sure it must be a well-known one. I do, however, claim the following advantages over the clove-hitch :

- (1) Rapidity of formation—from start to finish, no more than ten to twenty seconds need be spent on it.
- (2) It abolishes any need for No. 2 bearer to release his grip at all until the ends are secured to the bottom of the splint, thus avoiding jarring of the fractured bone and resulting discomfort to the patient.
- (3) The length of material required for its formation is far less than the 9 feet recommended for the formation of the clove-hitch—the usual narrow-fold bandage is sufficient.
- (4) It is far easier to perform in the dark than is the clove-hitch method.

A DEVICE FOR RAISING INJURED LIMBS WHILST CASUALTIES ARE REMOVED ON STRETCHERS.

BY CAPTAIN F. GORDON CAWSTON, M.D.CANTAB.,
S.A.M.C. (Retired).

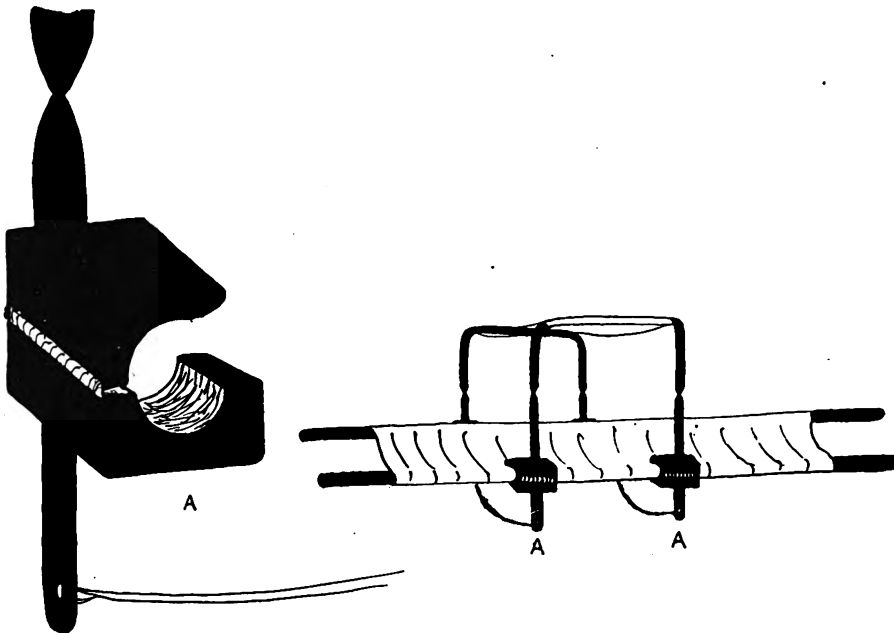
ALTHOUGH knowledge of useful pressure points to control hæmorrhage is rightly demanded of first-aid candidates there would seem to have been too much prominence given to the use of tourniquets judging from the answers given by even the youngest pupils of first-aid.

In a limited experience of surgical procedure I have seldom encountered a case of severe hæmorrhage which could not have been adequately controlled without a tourniquet and on two occasions of amputation was surprised to find that a tourniquet I had in readiness was not required.

If undue swelling of a limb to which a tourniquet has been applied is to be avoided, that limb must be raised and kept cool. Excessive use of lint may obscure the amount of bleeding which is taking place under bandages whilst undue warmth and swelling is encouraged unless the limb is raised.

To obviate the necessity for pillows, which tend to get soiled and shift out-of-place, canvas cross-bands have been suggested for raising an injured limb whilst a casualty is being conveyed on a hand-stretcher, but some difficulty has been experienced in producing a device applicable to all types.

A serviceable arrangement for the usual two-inch by one and a half inch stretcher-rods is considered unsuitable for military stretchers in common use whilst some special adaption is required where the stretcher-rods are of metal, as used in the Far East and as seen at Ambulance Stations.



The accompanying illustration is that of a device for fitting to the side of a round stretcher-rod and holding the ends of canvas-bands for supporting especially a lower limb, tilting of the rods being controlled by a pair of straining straps passed below the canvas on which a casualty rests.

The canvas support need be only about a foot in breadth, its size being exaggerated in the diagram. The device may be applied to any portion of the stretcher-rod without injuring the canvas or weakening the structure.

REFERENCE.

- CAWSTON, F. G. (1940). "A Suggested Means for the Control and Comfort of Injured Limbs during Transport by Hand-stretchers," *Journ. Trop. Med. & Hyg.*, XLIII, No. 14. July 15.

Current Literature.

CHUMAKOV, M. P., and SEITLENOK, N. A. **Tick-borne Human Encephalitis in the European Part of USSR and Siberia.** *Science*. 1940, Sept. 20, v. 92, 263-4.

The authors recall that in recent years a new virus disease of the central nervous system, the verno-æstival or tick-borne encephalitis, has been discovered in the Far East of the USSR. The disease is carried by ticks of the genus *Ixodes* and is endemic in certain woody localities. The virus closely resembles those of St. Louis and Japanese encephalitis except in antigenic structure and in certain other peculiarities.

The authors now record their finding of the disease beyond the woodland zone and their discovery that the sera of patients diagnosed as suffering from the diseases known as "atypical poliomyelitis," "serous meningitis," "post-grip encephalitis," etc., neutralize the virus of the tick-borne encephalitis of the Far East. The disease is acute, with fever and flaccid paralysis; the season of incidence is May to September and persons affected are frequently those whose work takes them into the forest areas where they are attacked by the tick *Ixodes persulcatus*.

Four strains of virus were isolated from man, over twenty from ticks, and four from the brains of wild rodents. All strains were examined by cross neutralization tests and cross vaccination of mice, and were found to be identical with the tick-borne encephalitis of the Far East. In the ticks the virus is transmitted through the ovum and during metamorphosis; it is apparently harmless to them. Further study of geographical distribution and relation to other tick-borne virus diseases is necessary.

C. W.

Reprinted from "Bulletin of Hygiene," Vol. 16, No. 2.

DAHLSTROM, A. W. **The Instability of the Tuberculin Reaction. Observations on Dispensary Patients with Special Reference to the Existence of Demonstrable Tuberculous Lesions and the Degree of Exposure to Tubercle Bacilli.** *Amer. Rev. Tuberculosis*. 1940, v. 42, 471-87, 3 figs.

The author has studied 3,919 persons who remained under observation for at least five years. Of these 2,490 were positive to tuberculin, and the majority remained so, but 276 (11.1 per cent) became tuberculin-negative either transitorily or for the duration of the study. It was found that the chance of reversal from positive to negative was least: (1) In those in whom the original reaction was intense; (2) in those who were in continuous contact with infective patients, though if contact was broken the proportion

who reverted to negative was higher, and in families in which there was no history of contact the proportion of those who reverted to negative was as high as 24 per cent; (3) in those with active reinfection type of tuberculosis, though some persons with calcified primary lesions became negative. So far as race is concerned the results were not very marked, but it appeared that Italians had less tendency than Negroes to react strongly and were much more likely to lose sensitivity. Children were more likely to lose sensitivity than adults; thus, in children 35.1 per cent lost sensitivity between the ages of 10 and 14, whereas of persons over 20 only 4.7 per cent did so.

These findings are important in that they indicate that the proportion of positive reactors in a community is not an accurate index of the amount of infection which has occurred, and that the persistence of a positive reaction may to some extent depend upon the occurrence of reinfection.

Reprinted from "Bulletin of Hygiene," Vol. 16, No. 2.

LOGAN, J. O., and SAVELL, W. L. **Calcium Hypochlorite in Water Purification.** *J. Amer. Water Works Ass.* 1940, v. 32, 1517-27.

After outlining the history of chlorination in America and commenting on the fluctuating popularity of bleach and of liquid chlorine as water sterilants, the author describes modern calcium hypochlorite.

The substance must not be confused with chloride of lime, nor is it in any sense an improved chloride of lime. The two compounds differ completely in mode of production and properties. Whereas chloride of lime is of variable composition and unstable, modern calcium hypochlorite is of constant composition and is very stable; during storage at 86° F. for a year, the loss of available chlorine was only 10 per cent.

Modern calcium hypochlorite is a dry, white, almost dustless granular material weighing about 45 pounds per cubic foot. The available chlorine amounts to 70 per cent which is twice as much chlorine per unit of gross weight as that carried by a cylinder of liquid chlorine.

Another important property is its high oxidation potential. The reaction is spontaneous with many organic substances such as turpentine, sugars, oils, fats, etc., and care should be taken to see that all tools and utensils used in handling it are clean and free from such substances.

Whilst it is improbable that calcium hypochlorite will supersede liquid chlorine as the main sterilizing agent in large supplies, it is very useful for small installations and for jobs of disinfection connected with the water purification system, such as disinfecting of reservoirs, settling basins, mixing equipment and pipe lines in the distribution system.

An emergency stock of hypochlorite on hand in a municipal plant may provide a practical means of solving a breach in the main chlorination [such as that caused by bomb damage] or when there is a sudden extra demand for water for fire-fighting purposes.

E. WINDLE TAYLOR.

Reprinted from "Bulletin of Hygiene," Vol. 16, No. 2.

Reviews.

MODERN TREATMENT IN GENERAL PRACTICE YEAR BOOK, 1941. Edited by Cecil P. G. Wakeley, C.B., D.Sc., F.R.C.S. London: Baillière, Tindall, and Cox, 1941. Pp. xxv + 326. 24 plates, 33 illus. Forty-three articles. Price 12s. 6d.

The above volume is a collection of short papers on treatment reprinted from the *Medical Press and Circular*. The first thirty-one articles deal with various diseases of civilian life. They are contributed by well-known authors and will be found on the whole informative and of general interest to practitioners. The concluding twelve articles deal with War Medicine and Surgery. They vary a good deal in quality and no attempt is made to cover the whole field. War wounds of the fingers are dealt with by Surgeon Commander J. B. Oldham in an article of out-standing excellence which might well be read by all surgeons. Wounds of the upper thigh and buttock are treated in a less fortunate manner and become a catalogue of operations which will be of little use to the perplexed medical officer. Also there must surely be gross errors of description in the accompanying illustrative case. Burns, considering the difficulties under which any author on this subject now labours, are adequately treated apart from an unfortunate substitution of days for hours in the description of secondary shock.

D. S. P. W.

Major J. J. R. Duthie, R.A.M.C., sends us the following impression of "The Medical Aspects of Boxing," by Ernst Jokl, M.D. Pretoria: J. L. van Schaik, Ltd. 1941. Pp. 251.

"Dr. Jokl has made a genuine and well-documented attempt to indicate the dangers inherent in boxing both as a profession and as a sport. He has approached the subject from a scientific point of view and has presented his case in a most able manner. I personally agree with a great deal of what he says especially in relation to professional boxing. I must confess that, in my own experience, I have never seen serious injury result from amateur boxing as practised in the Scottish Universities although the possibility is always present as in any strenuous sport. Dr. Jokl denies that there is any proof that boxing cultivates desirable qualities and here I do thoroughly disagree with him. I think boxing, under proper control, breeds courage, endurance, speed, agility, and self-confidence. With a competent referee and judges in charge, I am convinced that, although the danger of serious injury cannot be eliminated, it can be reduced to a negligible risk and that boxing, under Army rules, is an exercise of great value in cultivating those qualities of courage and endurance which are essential to the soldier

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on active service. One must face realities and it is obvious that when a man dons uniform he automatically exposes himself to the risk of serious injury or death. Any sport, therefore, which will cultivate in him those qualities which will stand him in good stead in conditions of war must be of great value even though there is some inherent risk in the sport itself. With regard to boxing in schools and colleges where supervision, both lay and medical, may be inefficient, and where the age of the contestants renders them more liable to injury, I am inclined to agree with Dr. Jokl that boxing should be discouraged. I also agree with him that boxing is not a suitable sport for flying personnel in the Air Force where the effects of even relatively mild concussion may lower efficiency temporarily and lead to serious results.

"Boxers should, I think, be carefully examined by an experienced doctor both before and *after* a fight in order to obviate the risk of a man who has sustained some injury, the effects of which are not immediately obvious, departing without medical examination.

"I have read Dr. Jokl's book with great interest and find it a most praiseworthy attempt to investigate the medical aspect of a popular sport. Much remains to be done by the medical profession in this field."

TALKS TO JUNIOR MILITARY MEDICAL OFFICERS, ARMY IN INDIA. By Colonel H. J. Manockjee Cursetjee, *D.S.O.*, M.B., I.M.S., Meerut District Headquarters, Dehra Dun, India. Printed privately.

These "Talks to Junior Officers" have been collected to form an excellent little book which will be of value to all medical officers when first arriving in India, whether they be officers of the R.A.M.C. or I.M.S. There is no reference to duties on active service but the author has very successfully dealt with the ordinary day-to-day duties in Cantonments. Most useful information regarding various I.A.Fs. and books of regulations is given in the Appendices.

THE ACTION OF MUSCLES, INCLUDING MUSCLE REST AND MUSCLE RE-EDUCATION. By Sir Colin MacKenzie, M.D., F.R.C.S., F.R.S.Edin. Reprinted from the Second Edition. Biographical Note by C. V. MacKay, M.D.Melb., F.R.A.C.P. London: H. K. Lewis & Co., Ltd. 1940. Pp. xxiv + 288; 100 Illustrations with Portrait. Demy 8vo. Price 12s. 6d. net.

Sir Colin MacKenzie, Professor of Comparative Anatomy and Director of the Australian Institute of Anatomy, Canberra, died in 1938. A successful career as an orthopædic surgeon specializing in the deformities following upon paralyses and a hobby of comparative anatomy, which later became his absorbing interest, gave him a unique knowledge and perspective of muscle action.

The first edition of the "Action of Muscles" appeared in 1918. The

present issue is a reprint of the second edition published in 1930 and contains a memoir by his cousin Dr. Charles MacKay, who during the author's lifetime acted as his close friend and collaborator. Sir Colin MacKenzie was a great individualist and this volume is no mere compendium of collective knowledge but embodies the results of a lifetime's observation and meditation on muscle action. Such a work cannot be brought up to date by another mind and Dr. MacKay must be congratulated on leaving the text unaltered. Whilst some of MacKenzie's principles of muscle action may not be clear or acceptable to the reader, the section of the book dealing with the specific action of individual muscles will perhaps disturb many preconceptions and is a refreshing counterblast to the traditional descriptions in many anatomical textbooks. "Function of muscle, the all-important factor," he has written, "cannot be satisfactorily taught in the dissecting room. It can only be taught in the living and is largely a question of comparison between the normal and paralytic. Only on this plan can the question of the origin and insertion of a muscle have more than an academic or rather examination interest for students." Whether we believe in MacKenzie's theories or not there can be no gainsaying that his methods of muscle re-education have been crowned with success. Influenced at an early age by the principles of muscle rest and recovery enunciated by Sir Robert Jones, MacKenzie developed these ideas and, not being content to wait until relaxation by itself produced recovery, he evolved his theories relating to muscle re-education. His methods of testing for muscle action, the idea of the minimal load, the zero position for recovery, and the use of the smooth powdered surface of cardboard for re-education muscle work were his own original advances. A plea for the use of intelligence in muscle re-education was the kernel of his teaching. "An ounce of scientifically directed volitional effort is worth pounds of passive treatment. With this in mind it is wonderful what can be accomplished in a warm room with the aid of a table, a few pillows, and a sheet of powdered cardboard."

The stream of orthopaedic casualties from the Western Front stimulated MacKenzie to produce this work. The present is unfortunately a most opportune moment for its republication and it is recommended to all young surgeons.

D. S. P. W.

JOURNAL

OF THE

ROYAL ARMY MEDICAL CORPS

Corps News.

OCTOBER, 1941.

EXTRACTS FROM THE "LONDON GAZETTE."

Aug. 22.—Lt.-Gen. A. Hood, *C.B.E.*, M.D. (18164), (late R.A.M.C.), to be Hon. Physician to His Majesty Aug. 1, 1941 (vice Lt.-Gen. Sir William P. MacArthur, *K.C.B.*, *D.S.O.*, *O.B.E.*, M.D., D.Sc., F.R.C.P., F.R.C.P.I. (15), (late R.A.M.C.), who has retired).

Aug. 26.—Maj.-Gen. H. P. W. Barrow, *C.B.*, *C.M.G.*, *D.S.O.*, *O.B.E.* (26352), ret. pay (late R.A.M.C.), is apptd. Col. Comdt., Aug. 27, 1941 (vice Maj.-Gen. R. S. Hannay, *C.B.*, *C.M.G.*, *D.S.O.* 10033), ret. pay (late R.A.M.C.), who has attained the age limit for the appt.).

Short Service Commission.—Lt. C. D. Cruickshank (144552), to be Capt. Aug. 18, 1941.

Aug. 29.—Lt.-Col. R. G. Martyn, M.B. (8715), retires Aug. 25, 1941, and remains empld.

Maj. (temp. Lt.-Col.) W. Bruce, *O.B.E.*, M.B. (10096), to be Lt.-Col. Aug. 25, 1941.

Short Service Commission.—The appt. of Lt. J. A. Farrell (85409) is antedated to Feb. 1, 1938, under the provs. of Art. 39, Royal Warrant for Pay and Promotion, 1940, but not to carry pay and allices. prior to Feb. 1, 1939.

Lt. J. A. Farrell (85409) to be Capt. Feb. 1, 1940, with seniority Feb. 1, 1939. (Substituted for the notfn. in the *Gazette* of Feb. 20, 1940.)

Sept. 2. — The undermentioned Capts. (temp. Maj.) to be Majs.:

T. M. R. Ahern, M.B. (52443). July 28, 1941.

R. Johnston, M.B. (52437). July 28, 1941.

J. B. MacFarlane, M.B. (51983). Aug. 1, 1941.

Lt.-Col. C. J. Blaikie (14909), R.A.M.C., at his own request, reverts to the rank of Maj. whilst empld. during the present emergency. July 29, 1941.

Sept. 5.—Capt. D. B. O'Sullivan-Beare, M.B. (39246), h.p. list (late R.A.M.C.), retires on account of ill-health, receiving a gratuity. Aug. 21, 1941.

Sept. 9.—Maj. S. J. A. Walshe, *D.S.O.* (1641), ret. pay (late R.A.M.C.), is restd. to the rank of Lt.-Col. on ceasing to be empld. Sept. 7, 1941.

The undermentioned Capts. to be Majs.:

(Temp. Maj.) J. C. Barnetson, M.B. (41955). July 28, 1941.

(Temp. Maj.) H. J. R. Thorne, M.B. (51399). Aug. 4, 1941.

(Actg. Maj.) B. Blewitt, M.B. (52441). Aug. 17, 1941.

(Temp. Maj.) T. J. Moloney, M.B. (51371). Sept. 2, 1941.

Sept. 12.—Maj.-Gen. P. S. Tomlinson, *C.B.*, *D.S.O.*, M.R.C.P. (5847), late R.A.M.C., is appt. Hon. Physician to the King, Aug. 10, 1941, vice Maj.-Gen. R. W. D. Leslie, *C.B.*, *O.B.E.* (5372), late R.A.M.C., who has retired.

Short Service Commission.—Capt. A. F. Murray, M.B. (65401), forfeits nine months' service for the purposes of promotion. Mar. 17, 1941.

Temporary Commission.—Maj. P. N. Creagh (42191), relinquishes his commn. Sept. 11, 1941, and retains the rank of Maj.

Regular Army Reserve of Officers.

Sept. 9.—Col. R. A. Bryden, *D.S.O.* (11038) (late R.A.M.C.), ceases to belong to the Res. of Off. on account of ill-health. Sept. 10, 1941.

TERRITORIAL ARMY.

Aug. 29.—The KING has been graciously pleased to confer "The Efficiency Decoration" upon the following officers of the Territorial Army:

Colonel A. R. Laurie, M.B. (34416).
Lieutenant-Colonel D. W. E. Burridge, M.B. (21939).
Lieutenant-Colonel T. E. A. Carr, M.B. (40097).

Lieutenant-Colonel W. A. Ramsay, M.B. (31442).

Lieutenant-Colonel A. B. Williamson, M.D. (20428).

Major (temporary Lieutenant-Colonel) A. S. Pern (25932).

Major (temporary Lieutenant-Colonel) R. O. Townend (32653).

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Sept. 2.—The undermentioned Sisters resign their appts.:

Miss C. Smyth. July 8, 1941.

Miss C. C. Anderson. Aug. 13, 1941.

Sept. 5.—Sister Miss M. McGregor retires on ret. pay on account of ill-health. *Sept. 6, 1941.*

Sept. 9.—Sister Miss H. M. Smith, retires

on ret. pay on account of ill-health. *Sept. 10, 1941.*

The undermentioned Sisters resign their appts.:

Miss J. M. Hill. Aug. 31, 1941.

Miss C. A. Butler. *Sept. 1, 1941.*

Sept. 12.—Principal Matron Miss M. G. Kennedy, R.R.C., retires on ret. pay. *Sept. 12, 1941.*

COLONEL COMMANDANT, R.A.M.C.

Major-General Harold Percy Waller Barrow, *C.B., C.M.G., D.S.O., O.B.E.*, was appointed Colonel Commandant, R.A.M.C., August 27, 1941. It is interesting to note

that his grandfather, Inspector-General Thomas Waller Barrow, was gazetted Assistant Surgeon 2 Foot just a century ago—on June 8, 1841.

EXTRACT FROM WESTERN COMMAND ORDERS.

BY THE GENERAL OFFICER COMMANDING-IN-CHIEF, WESTERN COMMAND,
DATED THURSDAY, AUGUST 14, 1941.

"The General Officer Commanding-in-Chief wishes to express his appreciation of the courage and fine example displayed by the undermentioned:

Personnel of No. 6 Army Dental Laboratory, A.D. Corps.

Men of No. 6 Army Dental Laboratory, A.D. Corps, did fine work during an enemy air-raid when, after incendiaries had been

dropped, their co-operation saved part of a hospital from more severe damage. Their efforts secured equipment valued at some £5,000. They also freed a number of civilians trapped in a basement cellar which had been almost totally demolished by H.E., and on a third occasion gave excellent assistance when a land mine shattered a number of houses."

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We have nearly completed our parcels for the units in the Middle East.

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good service in Colonel Benson's action at Baakenlaagte on Oct. 30, 1901, and was awarded the *D.S.O.* for devotion to duty there. He received the Queen's Medal with four Clasps and the King's Medal with two Clasps. In the war of 1914-1918 he served in France from Aug. 1914, till Jan. 1916, and in Mesopotamia from Jan.

1916, till the end of the war. In Mesopotamia he was *A.D.M.S.* and later *D.D.M.S.* Six times mentioned in despatches he was awarded Brevets of Lieutenant-Colonel and Colonel; created *C.M.G.*; received the Order of St. Anne 2nd Class with Swords, 1914 Star and Clasp, British War and Victory Medals.

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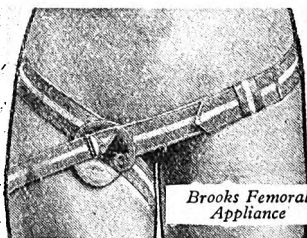
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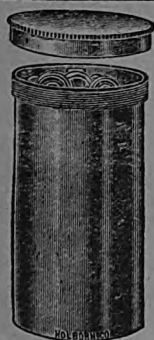
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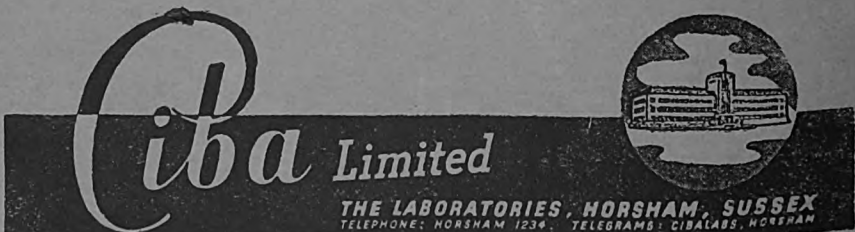
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Original Communications.

CLINICAL OBSERVATIONS ON SANDFLY FEVER IN THE PESHAWAR DISTRICT.

BY MAJOR W. M. E. ANDERSON, M.B., B.Ch.

Royal Army Medical Corps.

SANDFLY fever is an acute fever of short duration and no mortality caused by a specific virus which is transmitted by the bites of the sandfly *P. papatasii*.

The disease occurs in tropical and sub-tropical countries, notably the Mediterranean area, Northern India and parts of America, under various names, e.g. "Papatasii fever," "Three-day Fever," "Mediterranean Dengue," "Summer Influenza," etc. An account of the disease was recorded in 1803 by Pym (as quoted by Rogers and Megaw, 1939) and cases which were probably the first recorded in India were reported at Mian Mir by James (1903). It has frequently been confused with dengue, which it resembles, but it is now known that the two diseases are distinct conditions and are caused by different viruses transmitted by different vectors.

P. papatasii was demonstrated as the vector of the disease by Doerr, *et al.* (1909), who found that the fever could be produced in places where it was hitherto unknown by the bites of sandflies which had been fed on persons suffering from the disease in Dalmatia. Shortt, *et al.* (1934, 1935), confirmed this and were able to produce the disease in volunteers in a non-sandfly area (Kasauli) by the bites of sandflies which had previously been fed on patients suffering from the fever in Peshawar.

In the North-west Frontier Province and, to a lesser extent, in the Punjab

sandfly fever presents a problem of considerable military importance by reason of the large number of cases, amounting to an epidemic, which occurs each year among the British garrison. The military medical authorities in these regions have devoted much attention to the eradication of sandflies from barrack areas and, as a result of systematic preventive measures over a number of years, the incidence of the disease has been appreciably reduced. Many cases, however, still occur and it would appear that one of the chief difficulties of a final solution of the problem is that of diagnosis. The diagnosis of sandfly fever is by no means easy and may, sometimes, be extremely difficult. There is no generally available specific laboratory test and diagnosis can, as yet, only be reached through a proper interpretation of clinical observations. The traditional account is of a short sharp fever characterized by headache, photophobia, lumbar myalgia, flushing of the face, conjunctival suffusion, bradycardia, and leucopenia and, while a proportion of cases conform to this description and can be recognized at an early stage, cases of milder type also occur in which diagnosis is less easy. In addition there are, each year, many cases of short indeterminate fever which, in some respects, resemble sandfly fever and of which some, at least, are diagnosed as sandfly fever either as a result of incomplete examination or simply for want of a better diagnosis. Statistics which include these "sandfly-like" fevers but do not take account of undiagnosed mild but authentic cases must necessarily be inaccurate and a realization of this fact is essential if sandfly prevention is to be put on a satisfactory basis. Many anti-sandfly measures are still in an experimental stage and their efficacy can only be assessed by reference to statistics which reveal a decrease or otherwise in the incidence of the fever. Accurate statistics can only be produced by accurate diagnosis and, in an attempt to assist in this, observations on a number of proved cases are recorded here.

Mention has been made of the absence of a generally available laboratory test and, up to a few years ago, routine examinations in military laboratories in India yielded little positive information but the successful culture, on chorio-allantoic membrane, of the virus of the fever by Shortt, *et al.*, gave promise of more definite results. During the hot weather periods of 1938 and 1939, as portion of the work of an "Enquiry into Sandfly" fever under the auspices of the Indian Research Fund Association, specimens of serum were obtained from 133 patients in the wards of the British Military Hospital, Peshawar. In all these cases, from the history of onset and condition on admission, sandfly fever was considered a possible diagnosis at the outset and they form a fairly representative collection of typical and mild cases of the fever together with a number of cases of "sandfly-like" fevers. They do not, by any means, include all such cases who were admitted over the period as the personnel of the Enquiry was limited and other portions of the work made it impossible to visit the wards daily.

The number of specimens collected from each patient during the acute stage varied from one to five and they were, as a rule, collected at bi-daily

intervals commencing, when possible, on the day of onset although the shortage of personnel already mentioned sometimes prevented this. Further specimens were collected after the patient's discharge from hospital and investigated for the presence of virus. Reference will be made to the findings at a later stage.

A portion of each serum was dried and sent to the King Institute of Preventive Medicine, Guindy, Madras (the Headquarters of the Enquiry), where it was re-emulsified and inoculated on egg-membrane. The majority of the sera were also inoculated in like manner in Peshawar and, from the combined results, the 133 cases were classified as below, on a basis of whether or not lesions were produced typical of the virus of sandfly fever :

I. Positive (typical lesions)	..	..	..	..	78
II. Doubtful (lesions small in size and few in number)					14
III. Negative (no lesions produced)	..	..	..	..	40
Serum contaminated	..	..	..	..	1

Working conditions made it necessary for these sera to be stored in the refrigerator, in some cases for several weeks, before inoculation and the specimens sent to Guindy had to undergo desiccation followed by five days in the post at the hottest time of the year. It is believed that some of the cases in the "doubtful" and "negative" groups were probably true sandfly fever where the virus had failed to remain viable under these rather severe conditions but, as this must remain hypothetical, the observations on these patients are not included in the notes which follow.

For each patient records were made of clinical findings together with temperature and pulse readings. It was not possible to carry out more than a routine physical examination and, for such matters as blood counts and urine examinations, the information, when available, was procured from laboratory and clinical side room reports.

The notes of the 78 "positive cases" are summarized below and observations are also included on five volunteers in whom the fever was artificially induced by inoculation with infective serum during trials of a sandfly fever virus vaccine at the Pasteur Institute, Kasauli, in July and August 1938 (Shortt, *et al.*, 1940).

From the clinical viewpoint, attacks of the disease varied so considerably in intensity that it appears desirable to divide the cases into two types for which the names "severe" and "mild" are suggested. Some hesitation is felt in putting forward additions to the nomenclature but it is believed that this division will justify itself by emphasizing the fact, sometimes not clearly grasped, that the fever occurs in both very severe and also exceptionally mild forms. Of the 78 cases, 29 have been grouped as "severe" and 49 as "mild."

The ætiology, pathology and onset are common to both types and will be described together but separate descriptions will be given of the clinical features.

ÆTIOLOGY.

All cases occurred during the hot weather period commencing early in April and continuing until the last week of October. During the two years of the Enquiry, adult forms of *P. papatasi* were found in Peshawar from the first two weeks of March up to mid-November, so that the seasonal incidence of the disease coincides with that of the vector. Both severe and mild cases occurred throughout the season. Tabular records of the number of cases over the two years showed a progressive rise up to the early part of July after which there was a steady decline until mid-September, followed by a small secondary rise over the next six weeks. It is just possible that this secondary rise may be connected with the return from hill stations to the plains of numbers of troops and families who are not well versed in the various protective measures.

Seventy-two of the patients were men between 20 and 30 years and six between 31 and 38 but this is unimportant as the ages of most British troops in Peshawar fall within these limits. Investigation of the length of service in India showed that 30 patients (40 per cent) were in their first year, 58 (74 per cent) in their first two years, and 78 (86 per cent) in the first three. Of the remaining 10 cases, 5 were spending their first hot weather in a "sandfly area" (as defined by Rogers and Megaw, 1939). Four others gave a history of at least one similar attack in the past, which may or may not have been sandfly fever, and the remaining patient was a man of three and a half years Indian service who had, somewhat paradoxically, spent the previous hot weather at Landi Kotal in the Khyber Pass, a recognized hot-bed of the fever. The general trend of the evidence suggested that the fever is most likely to occur among comparatively new arrivals and, in this series, 80 per cent of cases were men with less than two years' service in a part of India where sandfly fever is endemic. There was no evidence that new arrivals are more liable to contract the disease in its severe form.

PATHOLOGY.

As there were no fatal cases, no information was forthcoming regarding the morbid anatomy. The clinical evidence rather suggested that the tissues most affected by the virus are those of ectodermal and, to a somewhat lesser extent, of mesodermal origin, while tissues developed from the entodermal layer appear to be only slightly affected. The evidence on this point requires considerable amplification.

INCUBATION PERIOD.

Among the five artificially infected volunteers the days of onset were as follows: two on the sixth day and one on each of the seventh, eighth and tenth days. This incubation period is rather longer than that mentioned in many textbooks.

ONSET.

In about 50 per cent of cases there was a short, rather vague premonitory period during which the patient felt slightly "off-colour," with lassitude, loss of appetite and slight muscular discomfort; four patients complained of nausea and two of mild vomiting. This premonitory period was completely absent in other cases but, when present, lasted for one to two days and was succeeded by the true initial phase, consisting of severe frontal headache accompanied by very marked malaise. About 75 per cent of patients stated that they first felt really ill on waking in the morning or after the afternoon siesta; a few reported the onset of symptoms shortly after strenuous exercise such as a game of football or hockey. In about 30 per cent of cases the first complaint was a feeling of chilliness but in none was there a history of a true rigor. Sweating was not an early symptom but this feeling of chill frequently induced the patient to put on an extra blanket or a woollen garment which sometimes produced sweating. As the headache became more severe its intensity drew the patient's attention from his other symptoms so that, in almost every case, he reported sick with "severe headache," a matter of no little importance in distinguishing the disease from other febrile conditions in which the first complaint is of "general malaise" (or words to that effect!). The onset was usually fairly rapid and in most cases the symptoms were well marked within two to three hours of the commencement of the true initial phase.

CLINICAL FEATURES. THE SEVERE TYPE.

The cases in this group conformed in most ways to the textbook description and the symptoms were well marked, enabling diagnosis to be reached without undue hesitation. It was found that patients did not always display every symptom and, at times, the diagnosis was made in the absence of some or other feature normally associated with the fever. As will be seen, this gap in the evidence was usually compensated by an accentuation of other symptoms, e.g. in cases where backache was slight or absent, the "eye-signs" were well marked, etc.

Symptoms.

The essential symptoms of the disease appeared to be headache, malaise, pain behind the eyes, backache and myalgia.

Headache was present in all twenty-nine cases and was most prominent in the lower frontal and supraorbital regions. In four cases it also involved the occipital region, and in one, the apex. This was possibly due to some extraneous factor such as eyestrain or was of intestinal origin (three of these five patients complained of mild abdominal symptoms). The typical "sandfly headache" appears to be "low frontal, extending into the orbits." This headache was very severe and frequently caused insomnia.

Malaise was always present and very severe. In the early stages patients

felt extremely ill and became mentally dulled with little or no interest in the outside world. In this stuporose state it was sometimes a matter of no little difficulty to extract an account of the symptoms.

Pain behind the eyes, in addition to the headache, was present in twenty-eight cases and *photophobia* in twenty-one. When these were absent the headache tended to involve the frontal rather than the supraorbital region.

Backache was present in all but two cases (in both of whom the headache was well marked) and in ten was very severe. It was usually described as being in "the small of the back," i.e. the lower lumbar or lumbo-sacral regions.

Myalgia was usually present. In sixteen cases it was most marked in the muscles of the thighs and calves. In two of them, it was also present in the arms and shoulders. In four cases the upper extremity muscles were most affected and in four the myalgia was general. In two cases it was absent in both of whom the "eye-signs" were well marked. As a rule active movements of the affected muscles were painful.

There was some evidence that the myalgia may also be present in the orbital muscles, as shown by pain or discomfort on moving the eyes. Out of fourteen cases this was present in eleven in eight of whom the pain was experienced during movement and in three at the end of the movement. Movements of each muscle were carried out in turn and there was no evidence of any particular muscle or nerve being specially affected. This phenomenon was particularly obvious in patients with severe orbital headache and pain behind the eyes and who complained of severe myalgia in other regions. It was not seen in cases where there was no myalgia elsewhere.

Certain other symptoms were noted but are considered of less diagnostic importance.

Sore throat was present in mild degree in three cases and consisted of little more than a feeling of dryness on swallowing.

Joint pains were frequently mentioned by the patient but further questioning elicited that the pain was really in the muscles about the joint. Only one patient had a true arthralgia which was referred to the knees.

Pains in the chest were reported in one case in whom bronchitis was also present.

Abdominal symptoms of mild type were encountered in the early stages of fifteen cases, i.e. two of vomiting, six of nausea, five of constipation, one of vomiting and nausea and one of nausea and constipation. These were never severe and resembled the intestinal upsets which accompany the onset of other acute fevers. Actual abdominal pains (also mild in type) were present in two cases, in one associated with nausea and in the other with constipation, and consisted of rather vague pains in the upper part of the abdomen. There was always a disinclination for food when the temperature was raised. No other evidence was forthcoming that intestinal disorders are an essential feature of sandfly fever.

Physical Signs.

Severe cases of sandfly fever presented a very typical picture. The patient's face was flushed, conjunctival vessels very suffused and the skin hot and dry to the touch. He usually lay slightly on one side with head turned away from the light and a hand shading his eyes. When the disease becomes established the patient looks, and is, extremely ill.

The skin in the first twenty-four hours was hot and dry. Later, with the administration of diaphoretics, it became slightly moist. No rash was observed but a few patients showed spots due to insect bites and there were many cases of "prickly heat."

Flushing of the face was very noticeable, especially in fair-complexioned patients, and involved the forehead, cheeks, front of the neck and sometimes the upper part of the chest and did not blanch on pressure. The affected skin was bright red in colour fading gradually towards the periphery.

Conjunctival suffusion was present in all cases and varied from a general redness to a well-defined injection of vessels. In nine cases this injection was most marked at the outer canthus, in nine at both canthi, presenting the appearance of a horizontal zone of dilated vessels, and in eleven the suffusion was general. While this is a physical sign of definite confirmatory value it must be borne in mind that such factors as electric fans, dust storms and over-chlorinated swimming baths tend to produce mildly bloodshot eyes in healthy persons during an Indian hot weather.

Rhinitis was present in only one case and was then only mild. There were no cases of *epistaxis* or pronounced *lacrimation*.

The *tongue*, in all cases, was coated with a whitish yellow or whitish brown fur. The last sixteen cases of the series were particularly examined for the presence of a clean red margin at the sides and tip, as described by Phillips (1923), and this was found to be present in fifteen.

Faucial injection, usually well marked, was present in twenty-two cases and is probably of value as a confirmatory sign. There were no cases of cervical adenitis.

Heart and Lungs.—One patient had a slight bronchitis and gave a history of numerous previous attacks. Otherwise there were no cardiac or pulmonary abnormalities.

Muscular Tenderness.—Painful muscles were sometimes tender on palpation. In twenty-seven patients with backache, eleven complained of a little tenderness on pressure over the loins and one particularly mentioned that lying flat on his back increased the pain.

Central Nervous System.—The pupillary reflexes were normal. Abdominal reflexes and knee-jerks tended to be sluggish but were never completely absent.

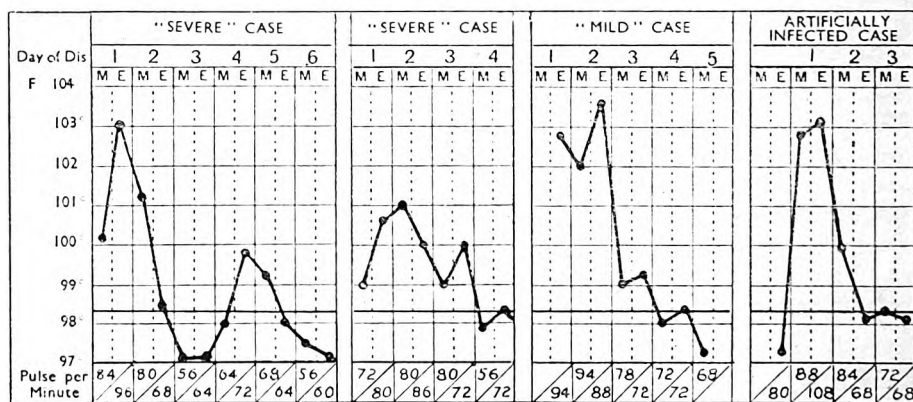
Leucocyte Counts.—Clinical side room reports were forthcoming in seven cases and the mean of the results was as follows: Total white cells 3,300. Polymorphonuclears 56 per cent; lymphocytes 24 per cent; large mononuclears 16 per cent; eosinophils 3.7 per cent; basophils 0.3 per cent.

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This agrees with the finding of McCarrison (1907), in his cases in Chitral, of a leucopenia with a relative decrease in polymorphs and an increase in large mononuclears.

The urine was examined in thirteen cases of which one showed a "trace" of albumin on the first day of fever. This was absent on subsequent days.

Temperature and Pulse.—In cases seen very soon after the onset, the temperature was sometimes only slightly above normal but rose very rapidly, sometimes by as much as 4° F. in a few hours. The duration of fever was as follows: two days 6 cases; three days 16 cases; four days 4 cases; five days 3 cases. There was a definite tendency for the fever to be more prolonged when the patient delayed reporting sick for twenty-four hours or more after the onset. A secondary rise in temperature, defined as a rise to more than 99° F. occurring at least twenty-four hours after the original return to normal, was noted in three cases and lasted twenty-four hours. The maximum temperature reached varied from 101·0° to 104·8° F. with a mean of 102·6° F.



Sandfly Fever Temperature Charts.

The pulse is a very important diagnostic feature and in all cases was comparatively slow and full. To emphasize the presence of this relative bradycardia every pulse reading recorded on the charts has been set out in tabular form against the corresponding bi-daily temperature reading on the successive days of the fever (Table I).

In this table, to economize space when two or more pulse readings corresponding to a particular temperature are identical the figures are not repeated but, to indicate the general tendency, the figure nearest the mean is printed in heavier type.

This table includes both severe and mild cases as there was no noticeable difference in the pulse charts of the two groups. The pulse-rate of each patient was noted as part of the physical examination but the majority of

TABLE I.

PULSE RECORDS CORRESPONDING TO TEMPERATURE READINGS THROUGHOUT FEVER: THE FIGURE NEAREST TO THE MEAN IS SHOWN IN HEAVIER TYPE.

Temperature in °F.	Day 1		Day 2		Day 3		Day 4		Day 5	
	a.m.	p.m.	a.m.	p.m.	a.m.	p.m.	a.m.	p.m.	a.m.	p.m.
104.2—105	—	—	—	104 108 112	104	—	—	—	—	—
103.2—104	88 94 100	96	90 92	86 88 98	—	100 110	88 92	—	—	—
102.2—103	72 80 92 100	72 90 80 92 84 94 96 98	88 90 96 98	80 90 92 94 98	72 80 84 94 96	82 —	—	—	—	—
101.2—102	96 98	90 96	80 90 94 96	80 84 90 96	72 86 80 92 84 96 100	80 86 92	88 92	84 —	—	—
100.2—101	76 84	72 80 84 88 92	70 88 72 90 80 86	68 78 80 82 86	72 80 82 88 98	72 76 80 82	86	84	88	—
99.2—100	76 82 86	72 78 80	68 86 78 88 82 90 84	68 84 70 86 76 80	70 74 78 80	60 84 64 94 72 80	58 64 68 76 80	64 68 72 76	72 80	72 76
98.4—99	68 72	60 64	66	62 64 72 80	60 78 64 80 68 82 70	56 74 60 76 64 80 68 70	60 72 64 78 68 80 70	56 72 60 74 64 80 68	64 68	60 64 68

the figures in this table were recorded by the hospital staff and their absolute accuracy cannot be guaranteed. They show, however, quite clearly that, even at the height of the fever, the pulse is slow in relation to the temperature.

In nine cases, two severe and seven mild, the basal metabolic rate was calculated from Dale's formula and the results varied from +16 per cent to +46 per cent. It is doubtful if this observation is of any practical value.

Of the five experimentally inoculated volunteers (Indians) two developed the severe type of fever. Their incubation periods were six and seven days respectively, the onset was fairly rapid, within a few hours of the patient first feeling ill, and was accompanied by headache and lassitude. With the commencement of the fever there was intense headache in the lower frontal and supraorbital region and photophobia was very marked. There was severe malaise and myalgia, especially of the thighs, the conjunctivæ were very suffused and the tongue was coated. The chest and abdomen were

negative and there were no enlargements of the liver and spleen. The attacks of fever lasted two and four days and the maximum temperatures reached were 102.4° F. and 102.6° F. respectively, with relatively slow and full pulse. Neither of these patients showed a secondary rise of temperature.

Summary.

The clinical features of the severe type may be summarized as follows : a fever of acute onset lasting two to five days and characterized by frontal and supraorbital headache, pain behind the eyes, frequently photophobia, backache, myalgia chiefly in the legs and often in the orbital muscles, flushing of the face, conjunctival suffusion often most marked towards the canthi, coating of the tongue, usually with a red margin, injection of the fauces, leucopenia and relative bradycardia.

THE MILD TYPE.

As stated above there were forty-nine patients in the "mild" group, consisting of cases in which the fever was milder than in the "severe" group and, in consequence, the clinical picture was less definite and some of the features traditionally associated with the disease were absent. As the distinction between mild and severe cases is only one of degree it will be sufficient to refer briefly to the more important symptoms and signs and the frequency with which they occurred.

Headache was present in all cases and was exceptionally severe in 9. It occurred in the low frontal and supraorbital regions, usually in both, and in 5 cases was also present in the occipital region. Malaise was always present but in less degree than in the severe type. Pain behind the eyes was present in 38 cases and photophobia in 14. Twenty-seven patients had backache and 31 myalgia; in 24 of these the thighs and calves were chiefly affected and in 6 the myalgia was general. Ten patients complained of mild sore throat and one of mild discomfort in the upper abdomen.

The physical appearance of these patients varied considerably but, on admission, the majority looked definitely ill. Flushing of the face was present in 40 cases and the hot dry skin was rather less marked than in the severe group. Conjunctival suffusion occurred in all 49 patients; in 19 it was general, in 13 the outer canthus was chiefly affected and 17 showed the "zone" of injected vessels. Pain on moving the eyes was tested for in 18 cases and was present in 6, all of whom had myalgia in other muscles. There was one case of rhinitis. The tongue was coated in 44 cases and, out of 25 specially examined, the clean red margin was present in 16. Faucial injection occurred in 39 cases. No abnormalities of the chest were found. In 2 cases there was tenderness of the upper abdomen. Out of 25 patients with backache 16 complained of pain on pressure over the back. As in the severe group, the reaction to light was normal and the superficial and deep reflexes were slack.

Reports of white cell counts were only available in three cases and the

figures agreed with those already noted. The urine was examined in 16 cases and found to be normal.

The duration of the fever was as follows: one day 2 cases; two days 18; three days 18; four days 11; The maximum temperature reached varied from 100° to 104° F. Six showed a secondary rise of temperature to the region of 99.5° to 100° F., lasting for twelve to twenty-four hours. The pulse-rate was relatively slow. Although the fever was, on the average, slightly shorter and the maximum temperature slightly lower than in the severe group there was no evidence of a direct ratio between these factors and the severity of the attack.

In many of the mild cases some of the features described as typical of the severe form were absent but there was, almost always, sufficient evidence to form a diagnosis. For example, in eleven cases where backache and myalgia were both absent, this was offset by the presence of headache, pain behind the eyes, flushing of the face, conjunctival suffusion and coating of the tongue. Of the series there was only one case where, on clinical grounds alone, there was reasonable doubt as to the correct diagnosis; the clinical picture was of a patient with low frontal headache, general malaise, conjunctival suffusion and injection of the fauces, with fever of one day's duration, reaching 100.8° F., and a pulse-rate which did not exceed 76.

Three of the artificially inoculated volunteers developed the mild type of fever with respective incubation periods of six, eight and ten days. The more prominent features were headache, chiefly in the frontal region, malaise, backache, myalgia, chiefly affecting the thighs and conjunctival suffusion. Two patients complained of photophobia. The duration of fever was one, two and three days respectively and the maximum temperatures reached were 100.2°, 102.8° and 99.8° F., for which the corresponding pulse readings were 80, 88 and 80. One of these patients showed a secondary rise of temperature to 99.8° F., coming on twenty-four hours after the original return to normal and lasting twelve hours.

TABLE II.

RELATIVE FREQUENCY OF OCCURRENCE OF VARIOUS SIGNS AND SYMPTOMS.

<i>Symptoms</i>	<i>Percentage occurrence in</i>	
	<i>Severe cases</i>	<i>Mild cases</i>
Headache	100%	100%
Malaise	100%	100%
Pain behind eyes	96%	77%
Photophobia	70%	28%
Backache	92%	55%
Myalgia	92%	63%
<i>Physical Signs</i>		
Hot dry skins	100%	100%
Flushing of face	100%	81%
Conjunctival suffusion	100%	100%
Pain on moving eyes	80%	33%
Coated tongue with clean red margin	94%	64%
Faucial injection	73%	80%
Bradycardia	100%	100%

It is impossible to give a concise summary of the clinical features of the mild type which will cover even the majority of patients but the comparative frequency with which the more important symptoms and signs occurred in the cases in the two groups is shown in tabular form (Table II).

Too much emphasis cannot be laid on the necessity for very thorough physical examination and, in cases where sandfly fever appears at all likely to be present, particular attention should be paid to the clinical features described. Without careful and complete examination diagnosis is, at best, haphazard and unsatisfactory and is bound to result in the production of misleading statistics.

- COURSE OF THE DISEASE.

In the cases under review, after admission to hospital and the commencement of treatment, the temperature was under control within twelve to twenty-four hours and subsided by lysis with a gradual abatement of symptoms. A feature of the disease is its lowering physical and mental effects and, while patients were usually fit to get up twenty-four hours or so after the temperature subsided, they invariably felt very weak and it was several days before they were fit to return to barracks. The mental effects also took some time to pass off and depression and even apathy during convalescence were by no means unusual. The practice of sending men who have had sandfly fever to hill stations for a week or longer after discharge from hospital is to be very strongly endorsed.

Specimens of serum were collected during the weeks following the fever and it has been shown (Shortt, *et al.*, 1940) that well defined lesions were produced on egg membrane by a considerable number of sera collected four or five weeks after the date of onset. This would appear to indicate that virus is present in the blood of convalescents for a considerable time after recovery. It has not yet been shown that such convalescents act as reservoirs of infection and can transmit the virus to sandflies but it is for consideration whether they should be subject to some form of isolation such as sleeping in separate buildings and being issued with an extra supply of repellants.

DIFFERENTIAL DIAGNOSIS.

In considering the question of differential diagnosis, reference has been made to the fourteen "doubtful" and forty "negative" cases. All these were patients whose condition on admission gave reason to suppose that sandfly fever might be the diagnosis but, in several cases, further observation and investigation showed that the fever was due to another cause. Thus, there was one case each of benign tertian malaria, pleurisy and tonsillitis, two of bronchitis and one who appeared to be a severe reaction to a "T.A.B." inoculation. Of the remaining 48 cases, after reconsideration of the notes, a tentative diagnosis has been made in all but three. Nineteen patients (seven "doubtful" and twelve "negatives") are considered to have had sandfly fever but for some reason not clearly understood the virus did not

produce definite lesions or failed to remain viable on storage. Four patients who showed a combination of rigor at the onset, generalized pains in muscles and joints, rhinitis, sore throat and bronchial catarrh have been classed as influenza. There were eleven in whom abdominal symptoms, nausea, vomiting and constipation were prominent and who were probably representative of a type of case encountered in considerable numbers every hot weather, mostly among newcomers to the tropics, characterized by short low fever, headache, chiefly in the apex, vague pains all over the body, discomfort, tenderness of the abdomen and sometimes jaundice. This condition is probably caused through inadequate protection of the upper abdomen from the draught of fans and punkahs, combined with unwise eating and drinking and lack of attention to the bowels. Such cases are not infrequently labelled "enteritis" or "copræmic fever." The remaining eleven cases are believed to have been mild cases of "effects of heat." This condition, in its mild forms or, more important, in the early stages of the insidious forms, frequently simulates sandfly fever with severe headache, marked flushing of the face, and conjunctival suffusion, hot dry skin and myalgia of varying degree and nature. In mild "Heat" cases the skeletal reflexes may become abolished, there is usually definite gastric discomfort and the temperature in the rectum is raised by more than 2° F. above that in the mouth. In his mental state, the "Heat" case is often restless and even irritable in contrast to the "sandfly" patient who tends to be drowsy and rather apathetic.

Other conditions which may resemble sandfly fever include the early stages of almost all acute fevers, e.g. the enteric group, the typhus group, dengue, undulant fever and acute septic conditions. Successful differentiation depends on thorough physical examination, careful daily examination and making full use of the laboratory. The most important condition to be distinguished from sandfly fever is "effects of heat" in its insidious forms and the life of the patient may depend on early recognition and prompt treatment.

PROGNOSIS.

Recovery occurred in all cases and a search of the literature has failed to reveal any record of a fatal case. No positive evidence could be obtained of the occurrence of second attacks of the fever either in the same year or in successive years.

TREATMENT.

In all cases, on admission, the bowels were opened with calomel followed by salines and patients were kept in bed on free fluids and with no solid food. The remainder of the treatment was symptomatic, consisting of diaphoretics, such as aspirin, "A.P.C." or salicylates, given four-hourly until the temperature subsided. A few cases where the headache was very severe were given opium in the form of "three fifteens." It was not found possible to investigate the effectiveness of the sulphonamide derivatives.

It is beyond the scope of these notes to consider the question of preventive measures against sandflies.

INTER-RELATIONSHIP OF MILD AND SEVERE TYPES.

Although, as already stated, the division of cases into "severe" and "mild" is considered both justified and desirable, there is no reason to believe that they are caused by strains of different virulence and, in fact, the severity of the attack would appear to depend on the resistance of the patient. This was suggested by the results of some of the experimental inoculation work as shown in Table III.

TABLE III.
CLINICAL EFFECTS OF INOCULATION WITH INFECTIVE SERA.

Pool No.	Containing Sera from patients	Type of Fever in volunteers
II. 	2 Severe .. 1 Mild 	1 Severe (C). 1 Mild (I). 2 Negative (I, C).
III. 	2 Mild 1 Negative ..	1 Severe (C). 1 Mild (I).
IV. 	2 Severe 1 Mild 	1 Mild (I). 3 Negative (C, C, C.)

I = Volunteer previously inoculated with experimental sandfly fever virus vaccine.

C = Uninoculated control.

The volunteers were inoculated from pools, each of which consisted of a mixture of three sera from cases of clinical sandfly fever in Peshawar. The results from pools Nos. III and IV are of most interest as indicating the production of a "severe" case from "mild" case serum, and of a "mild" case from "severe" case serum. Should this observation be confirmed by subsequent work it would appear that individual resistance is the main factor which determines the severity of the attack unless evidence is forthcoming that the virus undergoes some form of variation.

ACKNOWLEDGMENTS.

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UREA TREATMENT OF WOUNDS.

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LIKE the ancient alchemists with their unremitting quest for the philosopher's stone surgeons search for a substance which will efficiently destroy pathogenic micro-organisms in the tissues without at the same time having harmful effect on the tissues themselves. While a large number of chemical compounds have been tried as bacteriocides it seems strange that so little effort appears to have been given to explore the feasibility of employing substances which are normally present in the body for this purpose. Symmers (1915) of Belfast investigated the anti-bacterial properties of urea more than twenty-five years ago. He observed that the presence of urea prevented the meningococcus from reducing hæmoglobin. Further laboratory tests showed that urea in certain concentrations killed non-sporing bacteria *in vitro* and that when added to tuberculous sputum it retarded and diminished the growth of pyogenic organisms and in fact rendered some specimens completely sterile. He also found that urea killed bacteria in the presence of blood and albuminous material and very readily destroyed *B. pyocyaneus*. Symmers refers to W. J. Wilson's work in which it was observed that urea in a concentration as low as 1·5 per cent caused cultures of *B. coli* to assume pleomorphic forms. Following the investigations of Symmers, T. S. Kirk (1915) put urea to the practical test of applying it to infected wounds. This he began in 1911 and continued to practise with enthusiasm throughout his surgical career. He found that rapid healing without congestion or irritation of the skin was produced. He claims that he opened up and cleaned out abscess cavities and, after packing them with urea and closing the skin with a continuous suture, he obtained healing by first intention despite the fact that the pus grew organisms which in some cases were gas producing. He first used a saturated solution but found that the application of dry crystalline urea covered by oiled silk to prevent absorption into the dressings gave better results. He found it to be completely without harmful action, having used it in the presence of bone plates, Thiersch grafts and in hernia wounds. Since urea is a stable chemical compound and can be stored for long periods in paper packets Kirk suggested its use as a first-aid dressing under war conditions. Kirk's observations do not appear to have aroused any very great enthusiasm following their publication but the method has been recently revived and it has been found to be extremely useful and has been favourably reported upon by W. Robinson (1936), Holder and McKay (1937), Muldavin and Holtzmann (1938) and the writer (1940).

Indications and Technique.—Urea is an efficient dressing in all infected

wounds and has been employed by me with gratifying results principally in infected traumatic wounds but also in superficial abscesses, carbuncles and suppurating lymphadenitis. The antiseptic power of urea is in direct proportion to its concentration and it should therefore be applied in the pure form and covered with some impervious material such as jaconet, sheet rubber, etc. Muldavin and Holtzmann used waxed paper which is easily made by autoclaving some stout paper in a flat tin with a small piece of hard paraffin. Sheet rubber can be improvised from discarded motor or cycle tubes and may be sterilized by boiling. The dressings are not touched for five days except in the case of trauma with a soiled wound. The excessive discharge of blood and serum in a fresh wound, especially where hæmostasis is not complete, makes it desirable to re-dress the wound in twenty-four hours on account of loss of urea from dilution. The second dressing may be left alone for five days or more. On removing the dressings from a grossly infected wound the appearance is quite remarkable. Fresh healthy granulations are observed which are seen to be bathed in a clear reddish fluid. Pus has been pushed aside and has soaked into the dressings though a little may be found between the skin and jaconet. Sloughs have disappeared unless they were very large to begin with, in which case it is better to excise them. Urea has little or no osmotic effect and is freely diffusible through most animal membranes. Since it passes without hindrance through the envelope of the red blood corpuscle saturated solutions lake blood just as readily as distilled water. The reddish colour of the serum bathing the granulations already alluded to is evidently due to the laking of blood escaping in small quantities. After one treatment many wounds can be regarded as virtually clean and further treated according to their size and situation. Large wounds can be skin grafted at once while smaller ones may be washed clean, dried, powdered with boracic acid powder and allowed to heal under a crust.

Abscesses are best treated by incision and thorough cleaning followed by a pack of solid urea. This is followed by healing with very little scarring. I have not employed Kirk's more daring method of evacuating the contents, packing with urea, and immediate suture.

Carbuncles may be treated by boldly excising a large circular block of skin and subjacent sloughy tissue of about half the diameter of the whole carbuncle or a little more. Any sloughs not included are curetted out. Hæmostasis is secured as far as possible and urea is packed in and the dressings are applied as firmly as possible over sheet rubber. This treatment gives the optimum cosmetic result and leaves only a small dimpled scar which is much less conspicuous than the old cruciate incision. This scar if on a conspicuous site can subsequently easily be excised or raised by the insertion of a free fat graft.

Urea treatment can be combined both with chemotherapy and with the closed plaster method. In fact whenever it is used on extremities splinting should be employed to secure immobility. It is not necessary to protect

the surrounding skin with ointments, etc., and none of my cases has complained of pain which could be held to be undoubtedly due to the urea.

ILLUSTRATIVE CASES.

Case 1.—A child aged 4 had the left leg torn in some machinery. Most of the skin was torn off the front of the leg and dorsum of the foot and was hanging in irregular flaps. The muscles of the anterior compartment were badly lacerated and all the tendons were avulsed from the muscle bellies. The ankle-joint and tarsal joints were opened. The wound contained much dirt. The skin edges and all damaged skin and muscle were cut away and dirt and manure was flushed out with saline. The wound was then mopped dry and powdered with urea, vaseline gauze bandaging applied and the limb was placed in a closed plaster. After three weeks pus soaked through the plaster but there was not much smell and much less than that in a previous similar case treated without urea. The plaster was removed and the treatment repeated. After three weeks the plaster was not much soaked but was removed and considerable healing had taken place and there were healthy granulations. Skin grafting was carried out and the child was left with a fairly useful limb though no movement was possible at the ankle-joint. Throughout the treatment the temperature did not exceed 100° F.

Case 2.—A man aged 40 slipped on some mud and fell. He sustained soiled compound fractures of the left radius and ulna. The wounds were excised, washed with saline, packed with urea and sutured. A closed plaster was applied with the elbow in flexion. The wounds healed by first intention and there was no pyrexia at any time following the operation.

Case 3.—A man aged 25 fell from a motor cycle and sustained loss of the skin of about half the distal part of the palm and extensive lacerations of the volar aspects of all the fingers and the back of the hand. The pulp and both phalanges of the thumb were missing, only the skin and nail remaining. All the metacarpals except the fifth and all the proximal phalanges of the fingers were fractured and the wound contained much dirt and grit. The patient claimed "good healing flesh" and requested the utmost conservatism in treatment. Skin edges and damaged tissue were excised and the wound was cleaned with saline, dressed with vaseline gauze and bandaged to a splint. Large doses of M & B 693 were administered during the first two days. The wound became badly infected and the fourth finger gangrenous and there was considerable smell. The patient refused to believe that the gangrenous finger was incapable of recovery and declined to have it amputated. The hand was liberally sprinkled with pure urea and bound up in jaconet and bandaged to a splint. Infection which was spreading up the arm at once became localized and the hand became less painful and, in spite of crushed bones and lacerated tendons and the presence of a gangrenous finger, the infection remained localized and benign. Pus collected between the fingers and was washed away. Healthy granulations soon covered the wound and most of the pus was seen to be coming from the fifth flexor tendon sheath. The hand eventually healed. During urea treatment the absence of swelling of the fingers was conspicuous.

Case 4.—A man aged 21 was operated upon for perinephric abscess through a Mayo incision. He discharged blood-stained thick pus for six days which poured out beyond the dressings. The wound was flushed out with a saturated solution of urea by means of a catheter and funnel after which barely sufficient discharge to soil the dressings came away. The coincident dramatic improvement in his clinical condition was remarkable.

Case 5.—A man aged 24 was bitten on the ankle by a cobra. Native medicines were applied and he was taken to a military hospital where he was given

antivenene. For three months the ankle remained swollen and painful and the patient suffered from giddiness. He then fell and twisted the ankle and it became so grossly swollen and painful that fracture was suspected. Two days later an abscess burst and pus was discharged through two openings on the lateral aspect. The two openings were joined by an incision but pus continued to be discharged for six weeks. The abscess was packed with urea under a closed dressing for six days. On removing the dressing all that remained was a small ulcer representing the incision. Two days later a swelling appeared on the medial side of the foot which subsided with fomentations. Evidently a small pocket had escaped the full action of the urea. Four days later the patient was discharged cured except for some stiffness.

Case 6.—A soldier aged 28 was shot through the left thumb by a rifle bullet which caused disintegration of the metacarpophalangeal joint. He was invalided back to India. On removing the closed plaster he was found to have a pin-point sinus on the volar aspect and a one inch irregular opening on the dorsum. Through the latter sequestra were removed and the wound was packed with pure urea and a closed plaster applied. No discharge appeared for three days. On the fourth day a serous discharge exuded from under the plaster and it became purulent on the twelfth day. On removing the plaster the dorsal wound had healed leaving a pin-point sinus.

Case 7.—A water carrier aged 18 was admitted to hospital with paronychia following breaking of the nail of the left great toe. This was treated with fomentations and eusol dressings. Twenty days later the nail was removed as there was no improvement. A foul stinking discharge persisted for five months in spite of dressing with concentrated magnesium sulphate, hypertonic sodium sulphate, saline packs and flavine in rotation. X-ray showed no bone involvement and the discharge showed ordinary pyogenic cocci and no fungoid organisms. The nail had commenced to grow and was one-eighth of an inch long. One treatment with urea deodorized the wound and two further treatments resulted in healing and the patient's discharge from hospital.

Case 8.—A man aged 26 fell from a chair and sustained a laceration of the buttock which discharged pus for a month. He was then admitted to hospital and a piece of wood three inches long was extracted from the wound. Pus continued to discharge. Three weeks later there was no improvement and the sinus was gently curetted under anæsthetic and packed with urea. On removing the dressings a week later it was noted that the discharge was serous and scanty. Two further weekly treatments resulted in healing with very little scarring.

Urea is a substance which is cheap, stable and an efficient bactericide. It is capable of preventing infection in a fresh contaminated wound and of controlling or eliminating bacterial growth in an infected wound. In addition, it appears to have some power of removing or promoting the solution of necrotic tissue but does not seem to exert any harmful influence on living tissues even when placed in contact with them in one hundred per cent concentration. It is freely soluble and diffusible and while it exerts little, if any, osmotic effect it no doubt soon becomes diluted, absorbed and excreted. The wound into which it has been put remains bathed in an innocuous medium, often completely sterile, which allows of rapid healing. Muldavin and Holtzmann state that it appears to have no direct power of stimulating epithelialization. From clinical observations of wounds, however, it seems very dubious if epithelialization can be "stimulated."

Epithelium will grow over any wound surface at its own rate when the conditions which prevent it from doing so are removed. The cases quoted as examples are, with the exception of the first, from current practice in a military hospital where urea treatment has not been used as a routine because it is not an authorized drug and supplies are limited. It has therefore only been used in exceptional cases and in cases where other methods of treatment had failed. Admittedly to accurately judge the true value of this treatment requires a large scale controlled series compared also with the sulphonamide pack method. The rising popularity of the latter method is at present based more on the opinions of individual surgeons than upon statistical records of controlled series of cases (Colebrook, 1940). Until more precise information becomes available it seems to be not inopportune to make a plea for the revival, with or without modification, of what Kirk advocated in 1915.

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A PORTABLE STEAM FIELD DISINFESTOR.

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THE present situation of the troops at home entails the accommodation of detachments of varying sizes in an astonishing variety of billets, requisitioned houses and converted mills.

While there are many units and formations which are large enough to justify the installation of a permanent disinfestor of one of the recognized commercial types, it has been found that there are many more, such as the detachments guarding vulnerable points, where the numbers do not justify the expense of a permanent installation. Moreover, it is just these small isolated detachments which are most liable to infestation by pediculi or scabies as they are frequently very badly placed in regard to bathing and laundry facilities.

It has not been found a practicable proposition to employ the Millbank Portable Disinfestor, with its trained staff, in cases where there are less than, say, a hundred men to deal with and the construction of a fixed field disinfestor, such as the Serbian Barrel, at each vulnerable point or group of requisitioned buildings has been found to lie beyond the capacity of the majority of units, many of which are extremely scattered.

It therefore occurred to me that a simple portable steam disinfestor which, while being within the capabilities of the average unit to construct, was yet compact enough to be moved around their various detachments and sufficiently foolproof to be worked by unskilled regimental personnel, would be a useful and desirable piece of equipment.

GENERAL DESCRIPTION.

From past experience of several improvised field disinfestors, a variety of points arose which it was desired to incorporate, with a view to increase of operating efficiency.

The standard ten-gallon oil drum was the obvious choice for the boiler ; the five-gallon drum has been found to be inadequate when anything larger than an ordinary beer-barrel is used as the clothing container. Moreover, it was considered desirable to make the steam generating plant sufficiently large to feed a bigger container, since we had been informed that a substantial number of hundred-and-fifty-gallon wine-casks, which would each take up to sixty blankets at one time, were available for purchase. In any case, the larger boiler will always feed a smaller container.

The standard ten-gallon drum measures 21 inches by 14 inches overall and it is these dimensions which settle all the others for the steam generator.

The firebox, the top part of which forms both the cradle for the boiler and the smokebox, is constructed of any available stout sheet metal, bent and riveted as described in detail on page 251.

It was decided that the entire apparatus must be able to be constructed from stock fittings and materials ; no workshop intervention must be essential. This is not to say, however, that the co-operation of a Field Workshop would not be extremely valuable.

The chimney is a section of standard three-inch stovepipe, such as is employed with the slow-combustion stoves which are being fitted in hutted camps. The loose chimney of the old pattern "Soyer" cooker may be used in place of this pipe. The modern pattern unfortunately has a fixed chimney. Steam piping is the standard iron gas "barrel" and all elbows, unions and backnuts are standard and from stock. Ordinary angle-iron, such as may be obtained from many salvage piles in the form of old bed-sides, provides the supports for the baffle-plate and for the firebars and firebox lining.

This baffle-plate is situated between the firebox and the boiler. It is not included in the fixed Serbian Barrel as described in the Army Manual of Hygiene and Sanitation (1934) [1] but it has been found by experience to be necessary. The thin metal (lead-coated iron of approximately 20 S.W.G. in thickness) from which most oil-drums are made will not stand up to the direct heat of the flames without burning through in a short time, which varies from drum to drum but which in one case was as short as a fortnight. Should unskilled attendants allow the generator to boil dry the life of the drum may be even shorter. The baffle, while admittedly increasing the time needed to get steam up, takes all the "burning"—and can be scrapped when it gives way, being easily replaced by any stray piece of thin sheet iron—which cannot be said for the boiler, with its carefully brazed pipe-unions.

The same simplicity of replacement is the principle underlying the loose lining and the firebars. The bars rest in notches cut in their supporting angle-irons and can be replaced in a moment by any odd pieces of railing picked off the scrap-heap while the lining of the firebox is simply sheet metal with two right-angle bends.

This tendency of parts to burn out has in the past been the great bugbear of the improvised field disinfector. The present model overcomes this difficulty by making the vulnerable parts easily replaceable and by lining the sheet metal sides of the firebox itself with asbestos sheeting, such as is used to protect the woodwork of huts behind the stoves, and which is fairly easily obtainable from the Sappers, in addition to the loose metal lining described above.

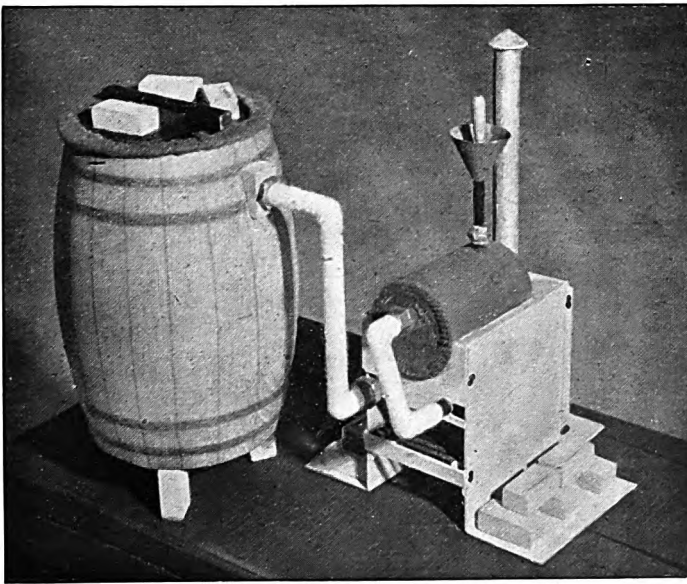
The generator is coal-fired, in view of the present difficulty in obtaining wickless oil stoves or petrol burners or their fuel, although these types of heater have many advantages, were they more easily obtainable.

The clothing-container, or Serbian Barrel proper, which is ideally made

from one of the large wine-casks referred to above, can at a pinch be made from any steam-tight container, on the lines of the Packing-case Disinfector or the Lelean Sack, although in cold weather this last loses too much heat to be really satisfactory.

The principle of sectional construction, which is to be described in detail, renders it possible to pack the entire plant inside the barrel which can then be moved from point to point by unit transport with considerable ease.

The lagging by a bank of earth, as described in the Manual for the fixed Serbian Barrel, is obviously out of the question in a portable model and; in any case, I have found that its value, especially in weather such as prevailed in the winter of 1939-40, is problematical. During that period the bank



Photograph of original scale model of Portable Disinfector.

froze solid, and tended to refrigerate the barrel rather than to conserve heat.

The portable barrel has therefore been *internally* lagged with a layer of blanket, nailed firmly around the top and bottom edges, and tightly stretched. This procedure leaves an air-space between the blanket and the curved wall of the barrel. The air-space, being a poor conductor, provides a measure of insulation which I have found to be more efficient than the bank of earth.

The blanket is turned six layers thick over the top edge of the barrel, and the lid is covered on its under surface by two layers. The contact between these two padded surfaces is excellent, and when the lid is weighted

by a few bricks the joint is to all practical intents steamtight. Half a dozen bricks are also needed to raise the perforated bottom of the barrel off the ground and thus allow free exit for the spent steam. The necessary bricks can usually be found on the site.

Where the ground conditions are suitable, it may be found possible either to sink the barrel into a pit, leaving several inches clearance all round, or to raise the steam generator off the ground on old masonry. If this can be done, the total run of steam piping may be reduced by the elimination of the vertical limb (*see fig. on page 250*).

The drawing in the Manual shows the steam feed-pipe led only just through the wall of the barrel, near the top. While this provides the essential downward feed, it has been found that there is a tendency, if the blankets are unskilfully packed, for an air-pocket to form near the top, at a point opposite the entry of the pipe. This is avoided by delivering the steam through a rather longer feed-pipe, so that it escapes at the mid-point of the diameter and as near the top as possible through an upturned elbow. The steam, after impinging on the under surface of the lid, is evenly distributed all round. This apparently small point can prevent the escape of a few lice in the top blanket and the subsequent reinfestation of the whole batch.

GENERAL CONSIDERATIONS AFFECTING THE FITTING OF A SUPERHEATER.

While it is well known that superheated steam, being a gas, has poor penetrating properties and is not therefore so efficient a disinfecting agent as current steam, a simple U-tube superheater running through the firebox, between the boiler and the baffle, was fitted for the following reasons:—

In the ordinary type of disinfector, without superheater, the steam leaves the boiler at 100° C., as current steam, possessing a latent heat of 537 calories per gramme and having expanded some 1,700 times in changing from water at boiling point to steam. During its passage through the piping it cools down considerably and it again cools, very rapidly, with contraction and cloud formation, on its escape into the barrel. There is thus a considerable loss of potential "disinfecting value" at the very outset, as the so-called "steam" reaching the blankets is, to a great extent, water in the form of cloud. In condensing back to water, steam contracts to $\frac{1}{1700}$ of its volume and, in so doing, gives up its latent heat. But since the steam has already partially condensed, the full value of this effect is lost. The contraction, which lowers the pressure within the barrel, not only tends to draw over more steam from the boiler but also, by reason of its tendency to produce a vacuum, increases the power of the steam to penetrate the blankets. The total loss of efficiency from both causes is obvious.

The effect of the superheater is that steam leaves the U-tube at a temperature considerably above 100° C., with the result that it reaches the

barrel at approximately boiling point, the additional heat having served to compensate for the inevitable losses due to cooling in the feed system.

Thus *true current steam* is fed to the infested blankets, having none of the disadvantages of a gas but having the advantage over the simple type of feed that it is truly at boiling point and, in condensing and contracting, it can yield up the whole of its 537 calories per gramme of latent heat to the blankets, with a consequent gain in efficiency and a reduction in the time required for safe disinfestation.

TIME REQUIRED FOR ADEQUATE DISINFESTATION.

No definite time is laid down in the Manual of Hygiene and Sanitation for disinfestation by the Serbian Barrel. The most recent investigations of temperatures lethal to the louse are those of Buxton (1940 *a, b*), [2, 3]. The *minimum* time required for the destruction of lice is of academic value since, in the field, an exposure well above this will invariably be given. As Buxton says, practical disinfestors do not regard ova (which are much more resistant than mature lice) as dead until they are collapsed and shrunk, a state which indicates that they have been subjected to a temperature well above the lethal threshold. Mature ova do not shrink unless they are exposed to a temperature of 65° C. for ten minutes. It is probably advisable to allow this period to elapse from the time when cloud is seen to be coming freely from the perforated bottom of the barrel.

This is considerably less than the exposure times and temperatures which were formerly thought to be necessary (Jameson and Parkinson, 1936) [4], and, when the superheater is in use, the safety factor is considerable, even with such short exposures.

It should, however, be remembered that a temperature which will kill lice and their ova will not necessarily sterilize the bacteria or viruses which they may be carrying. The custom of speaking of a Serbian Barrel as a "disinfector," instead of as a "disinfestor" is a dangerous one.

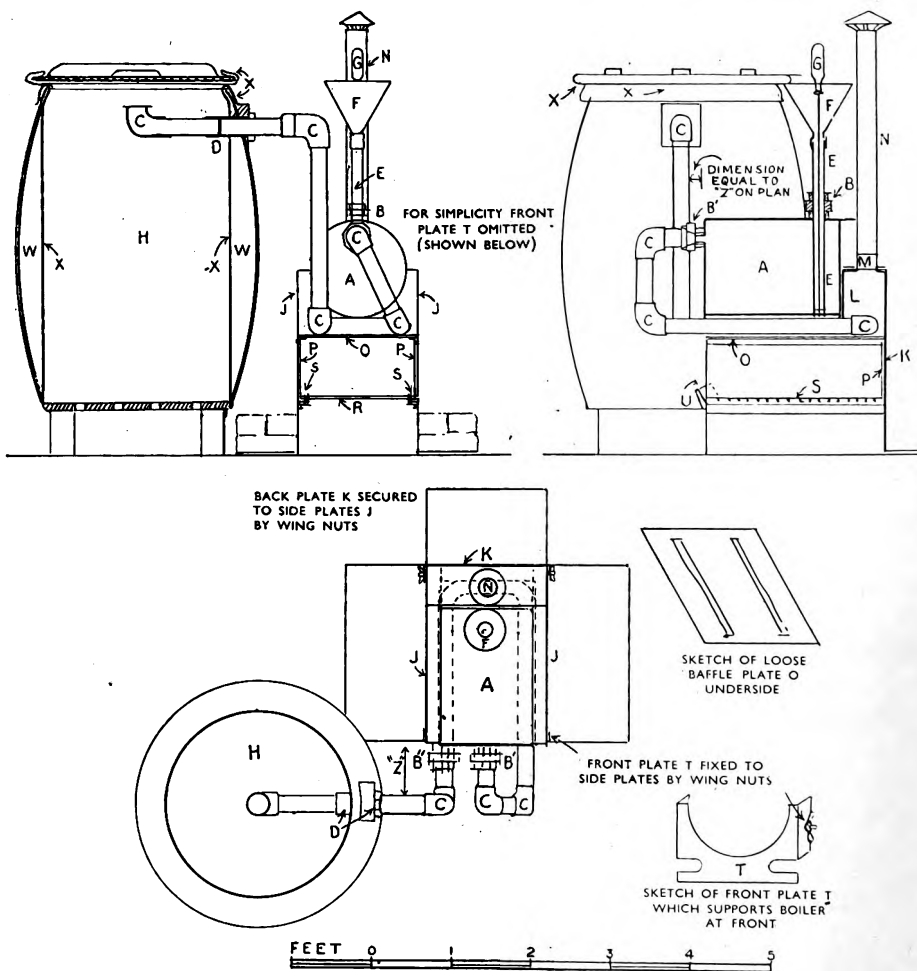
DETAILED DESCRIPTION OF CONSTRUCTION.

(See Plan. Letters refer to the Key thereon.)

The Boiler (A), a ten-gallon drum, lies horizontally. It is fitted with a *Filler-pipe (E)* made from $\frac{3}{4}$ -inch iron barrel. This is brazed in, and runs to within 1 inch of the bottom of the boiler, extending also 18 inches above the point of entry. It is broken just above the boiler by a screw-union (B) in order to facilitate packing for transport. *The Funnel (F)* may be an ordinary petrol-funnel, soldered to the pipe. In addition to its action as a filler and safety-valve, this pipe will emit a cloud of "steam" when the water level becomes dangerously low, and will warn the attendant to refill, if he is to avoid burning out the boiler.

The *steam-outlet* runs from the uppermost point of the opposite end of the boiler, to which is brazed the female half of a screw-union (B'). This

is of $1\frac{1}{2}$ to 2 inches bore, thus rendering it impossible for the filler and outlet pipes to be wrongly connected. The corresponding male half-union is fixed to the superheater pipe. This runs downwards, as shown, and thence horizontally below the boiler, in the form of a U, lying within the smokebox. At the point where the pipe leaves the smokebox a second screw-union is fitted (B"), again for ease in packing. These joints will stand up to 50



pounds per square inch pressure and therefore no risk of steam leakage is involved.

From this union the pipe runs up to its point of entry into the barrel. The plan shows how the short section within the barrel (D) unscrews from the main pipe by means of a straight socket. The main pipe can then be withdrawn from the barrel for packing. The short section ends in the

upturned elbow previously described. The point of entry into the barrel should be kept as high as possible, in order to secure freedom from air-pocketing. A wooden block is fixed to the barrel wall, in order to keep the inlet hole "square" to the pipe. An ordinary backnut beds up against this and ensures a reasonably steam-tight joint, especially as the wood swells a little when damp.

The Firebox consists of two side-plates (J), a back-plate (K) and a small front-plate (T). All these are bent-up from sheet metal, which should be of about 16 S.W.G. The back and sides have each a large flange which rests on the ground, a vertical part—the firebox wall proper—and a smaller horizontal flange at the top, extending inward to touch the end and sides of the boiler respectively. This top flange on the *back-plate* overlaps the flanges on the *side-plates* and carries, riveted to it, the short *stub* of pipe for the chimney (M). To the front of this flange there is secured by a wing-nut the *bracket* (L), supporting the rear end of the boiler. This is simply a 2-inch strip of sheet metal, bent twice at a right-angle, as shown in the plan (side elevation). The back-plate is also flanged up the edges, in order that it may be secured to the side-plates by wing-nuts. Reference to the plan will make the above points much clearer than can be done in text.

The front-plate (T) is sketched separately. The deep notches at the sides are cut to clear the superheater pipes and will therefore vary with the size of pipe available. This plate also forms the support for the front end of the boiler. It is secured to the side-plates by wing-nuts.

Asbestos sheeting is fastened by rivets to all four of the above plates, on their inner surfaces.

Six sections of light angle-iron are now required, the length of the side-plates. Two of these are riveted on as supports for the baffle-plate (O). Two others are deeply notched at $1\frac{1}{2}$ -inch intervals to take $\frac{1}{2}$ -inch firebars. These are now riveted "back-to-back" with the remaining two sections, and these in turn are riveted to the side-plates at (S). The two elevations in the plan make the arrangement clear. All angles should be fixed *after* the fitting of the asbestos lining.

The addition, by wing-nuts, of a small plate (U) to prevent the coal falling out completes the firebox proper.

The chimney (N) is a push-fit on the stub (M).

Replaceable Sections.

These are three; the baffle-plate, the firebox liner, and the firebars.

The baffle-plate is sketched at (O). It lies on the upper angle-irons, and is slotted below the superheater pipe. The slots may be quite rough, and simply knocked through with a cold chisel. It will be noted that the only way from the firebox to the chimney is through these slots, and that therefore the full heat plays on the superheater, while the centre of the plate protects the boiler.

The *firebox liner* (P) is made from a single piece of sheet metal, bent to form three sides of a rectangle rather smaller than the firebox. It rests on the lower angle-irons (S) which also support the seventeen *firebars* in the notches described above. Almost any scrap rod or bar will serve for these bars.

The *barrel* (H) should be the largest that can be found. It is not the steaming that takes time but the constant packing and unpacking of a small barrel with clothing.

The bottom is freely perforated with a large auger and the barrel itself supported clear of the ground on bricks.

A plain flat lid, preferably fitted with a handle, is well lagged with blanket nailed round the edge. In use, it should be weighted with bricks to secure good contact.

The lining of the barrel with blanket is clearly shown at (X), leaving the air-space (W). The fitting of the feed-pipe to the barrel has already been described.

Finally, a *dipstick* (G) will be found to be most valuable. It should be notched to show the correct water-level, and the attendant warned not to exceed this; the risk of water flowing over into the superheater is thus avoided. Should this happen in spite of precaution, uncouple the screw-unions, when the pipes can be easily cleared.

GENERAL NOTES.

Extreme of constructional detail has been avoided, as much will depend on the local availability of material.

By the use of wing-nuts and screw-unions, it has been found possible to make the entire plant so dismountable that it can be packed inside the barrel. A pair of handles fitted to the sides of the barrel make transport a matter of the utmost simplicity.

It is advisable, where this material can be obtained, to lag the exposed steam pipes with asbestos yarn; in the absence of this, strips of blanket or hessian will serve but are not such good insulators.

SUMMARY.

(1) A steam field disinfector, based on the Serbian Barrel, is described. It can be constructed, by local resources, from material which can be mainly "scrounged." It is entirely dismountable, so that it can be packed within the barrel intended for the clothing, and moved from site to site.

(2) This is of especial importance in the present situation where there are large numbers of troops employed in small isolated detachments, often with poor bathing and laundry facilities, and with increased liability to infestation.

(3) A superheater is included and the rationale of this is discussed.

(4) A feature is the simplicity of replacement of parts liable to burn out.

(5) The use of standard wing-nuts, screw-unions and different sizes of piping make the apparatus as nearly foolproof as possible. It can most certainly be operated by the personnel who transport it without constant expert supervision.

ACKNOWLEDGMENTS.

It is my pleasant duty to acknowledge the great assistance and helpful criticism which I have received from Colonel N. Low, *D.S.O., O.B.E., A.D.M.S.* ———, whose opinions, as a former Professor of Hygiene at the Royal Army Medical College, were especially valuable.

My thanks are also due to Lieutenant E. F. Massey, Royal Engineers, and to the staff of the D.C.R.E. ———, for advice on certain technicalities and for the preparation of the drawings.

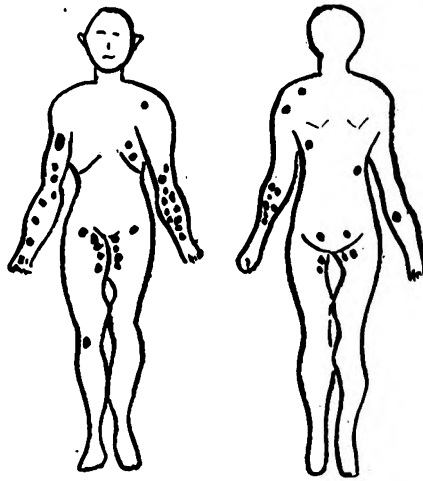
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SKIN ERUPTIONS FOLLOWING VACCINATION : REPORT ON A CASE.

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SKIN eruptions are not a common sequel of vaccination and their incidence would appear to be less than formerly. They tend to occur more often after primary vaccination than in re-vaccinated subjects. The abandonment of the method of cross-hatching in favour of the single linear insertion has probably been one of the causes of the decreased incidence of these rashes. Greater regard to asepsis in the act of vaccination as well as in the protection of the vaccinated area has also been an important factor in this.



Distribution of the lesions.

Increased care in the preparation of the lymph, which formerly was often contaminated, is also a point of importance in this connexion.

Different types of rashes may occur. These vary from the local erythema, of greater or less extent, which is a constant accompaniment of successful vaccination, to lesions which embrace either the affected arm or other parts of the body. Papulo-vesicular, erythematous and "serum" type rashes were described in the Report of the Committee on Vaccination [1]. Although most often confined to the vaccinated arm they were occasionally found in other situations. Ricketts stated that the generalized erythematous eruptions were associated with secondary products of inflammation. Papular and papulo-vesicular lesions (vaccinal lichen) he believed to be toxæmic

manifestations [2]. Many of the specific eruptions of generalized vaccinia recorded in the past were possibly variolous ; they followed the use of lymph containing the virus of smallpox. The appearance of a generalized vaccinia in a child who had sucked the vaccine pustule of another child is recorded. Auto-inoculation may occur when there are cuts or abrasions elsewhere on the body or when skin diseases co-exist. Such sequelæ are, however, surprisingly rare. The infrequency of generalized vaccinia is shown by the following figures, quoted by Rolleston [3] :

France	6 to 8 cases	among 600,000 vaccinated.
Denmark	4 cases	among 40,000 vaccinated.
Germany	5 cases	among 100,000 vaccinated.

Difficulties in diagnosis are very liable to arise during a smallpox epidemic when vaccination, performed late in the incubation period, may modify but not prevent an attack of smallpox. A certain similarity in distribution between variolous and non-variolous lesions such as vaccinal lichen may increase these difficulties. Lichen urticatus, a common skin disease of early life, is almost indistinguishable from vaccinal lichen [4]. The author, in 1931, described 14 cases in which a skin eruption followed vaccination [5]. The cases occurred in London during an epidemic of modified smallpox. Some were notified as smallpox, others were discovered during the routine examination of smallpox contacts. All the patients were children most of whom came from homes in which cleanliness was not a predominant feature. Vaccination was primary in every case, one linear insertion being made. The eruptions appeared between the ninth and fifteenth days after vaccination. In some cases the rash consisted of small papules on which crusts appeared in about forty-eight hours. In others the lesions were maculo-papular, with or without urticarial blebs. In certain instances the rash became almost morbiliform after the lapse of one or two days. In the cases which resembled lichen urticatus pruritus was absent. In general the distribution was somewhat akin to that of smallpox but the face remained unaffected and prominences and points of pressure or irritation were not unduly favoured.

REPORT OF A CASE.

A healthy soldier noticed a small pimple on the wrist eleven days after primary vaccination on the opposite arm. He stated that he had not previously suffered from any form of skin disease. There had been a moderate local reaction with a considerable zone of erythema and some œdema of the arm. Further papules made their appearance during the next seven days. The patient was first seen on the tenth day of the eruption or nearly three weeks after vaccination. There was a fairly profuse eruption of superficial, irregular vesicles from $\frac{1}{4}$ to 1 inch in diameter, many with small crusts in their centres. Little or no surrounding erythema was noticed. Pruritus had been absent from the commencement. The rash was most plentiful on the forearms, thighs and scrotal region. The distribution is

indicated in the diagram and in figs. 1 and 2. During the next week the vesicles dried up completely and there was generalized crusting. By the twentieth day after its first appearance nothing remained of the rash but large, irregular, pigmented areas (fig. 3).



FIG. 3.

SUMMARY.

A case is described in which a papular urticaria appeared on the eleventh day after primary vaccination. That the condition was a toxæmic manifestation, associated with vaccination, may be assumed from the time of its appearance. The occurrence of these rashes at a time when the vaccinal reaction is at its height, i.e. between the ninth and fourteenth days, was a constant feature in the cases previously described. The character and distribution of the lesions also closely resembled those of the former cases. The marked pigmentation which followed was, however, an unusual feature.

Despite the large number of primary vaccinations being performed on

soldiers at the present time, sequelæ of this nature would still appear to be rare. Local inquiry has not brought to light any record of other cases of this nature among vaccinated soldiers. Further information on this point would be of interest.

I am indebted to Dr. Hamilton Wilkie of Leicester for his kindness in taking the photographs and to Colonel F. R. Coppinger, *O.B.E.*, for permission to forward these notes for publication.

The originals are in colour and show the condition very well but, in view of present difficulties, black and white prints are substituted.

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- [4] CHALKE, H. D. (1932). "Lichen Urticatus: A Differential Diagnosis of Smallpox." *Brit. Med. Journ.*, January 24.
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REPORT ON A GROUP OF CASES OF BENIGN TERTIAN MALARIA WHICH IN THE EARLY STAGES SIMULATED GERMAN MEASLES.

BY MAJOR C. M. VAILLANT,
Royal Army Medical Corps.

SOME three months ago an officer patient was admitted to the hospital from a fighting unit with the diagnosis of German measles. At the time this was considered correct and we discussed how long he should remain isolated since in the last war it had been quite usual to do so for no longer than forty-eight hours.

The matter however resolved itself in an unexpected manner. Two nights later a convoy of twenty other ranks arrived from the unit, all with the same diagnosis. Most of them presented a rash indistinguishable, in the daylight, from that of German measles; conjunctival injection was present with pains behind the eyes and headache chiefly across the top of the forehead. The temperatures ranged around 101° to 103° F. In every case one sign was conspicuously absent; clinically there was no occipital adenitis. The diagnosis had been made before the men left their unit on grounds of the rash and the journey here had occupied some forty-eight hours. The rash, therefore, had persisted for about seventy-two hours and was more marked in some than in others. Treatment was symptomatic.

On the second morning it was decided that the fever was not following its true course since the temperature had not subsided, headache was persistent and in some cases the rash showed no sign of abatement. One patient, perhaps the most seriously ill of all, complained of left-sided upper abdominal pain. His spleen was tender and easily palpable and he admitted to similar symptoms in previous attacks of malaria. In six more cases the spleen was felt in greater or less degree. Blood films from all the patients were examined and the parasite of benign tertian malaria was found in each case. Standard treatment with quinine by mouth led to complete and uneventful recovery with disappearance of the rash in every patient. Later, more cases arrived making a total of about fifty.

At the time not a great deal of attention was paid to the rash, which was thought to originate from excessive perspiration, but it was considered advisable that the unit medical officer be informed. Gradually this finding became known locally and one had the opportunity of hearing the views of many doctors with large experience of malaria and of all its manifestations.

With one notable exception, they were most emphatic that they had never seen a rash in malaria provided no treatment had been given. Of the first twenty at least it may be stated that no treatment had been given

since they had had the rash when they went sick ; unless, of course, they had been getting it unofficially before reporting at sick parade.

It is not possible under present circumstances to inspect the literature on the history of malaria but all who have discussed the problem have had considerable experience and therefore their opinions carry weight. On the other hand the facts are beyond dispute. The unit inadvertently camped late one night near a swamp and soon afterwards several of its strength reported sick with malaise, fever, conjunctivitis and headache, accompanied by a rubelliform rash but without occipital adenitis. I have since had an opportunity of confirming this last point from their medical officer. Blood samples of the first twenty sick contained benign tertian malaria parasites and recovery was complete when treated with quinine. Finally, it has been ascertained that the date of exposure in the swamp was consistent with the incubation time of benign tertian malaria.

A possible explanation is that the men all had malaria parasites in their blood when an epidemic of German measles supervened ; but I have never seen a case of rubella without occipital adenitis and under these circumstances I consider the alternative untenable. Furthermore it is beyond the bounds of reasonable probability that every case of malaria should have German measles and that every case of clinical German measles should also have malaria. Finally, it seems unnecessary to postulate an unknown secondary infection and one concludes that these cases provide the very unusual combination of a rubelliform rash with benign tertian malaria, a complication not generally recognized.

I wish to thank Lieut.-Colonel A. Harrison-Hall, R.A.M.C., for permission to present this report and also for his welcome and constructive criticisms.

NOTE BY CONSULTANT IN TROPICAL MEDICINE, MIDDLE EAST FORCE.

I discussed these cases when I was down in the Sudan with Major Vaillant.

From what he told me and from the fact that nineteen of the twenty cases were shown to have malarial parasites in their blood, the obvious explanation is that all the cases had malaria and *prickly heat*.

The rash of prickly heat very closely resembles that of measles and I have often found typical cases of the former condition isolated under the mistaken impression that they were measles.

NOTE BY ASSISTANT PROFESSOR OF TROPICAL MEDICINE,
ROYAL ARMY MEDICAL COLLEGE.

An erythema, which may closely simulate that of scarlatina, is described as a not uncommon eruption with malaria. It is, however, improbable that such an erythema would be present in every one of twenty cases.

The opinion of Colonel Smith that these patients had malaria and prickly heat seems the most likely to be correct and it is possible that only in those who suffered from the fever and excessive sweating of malarial paroxysms did the lesions of prickly heat, probably common to all members of the unit, adopt a morbilliform character.

DRUM PORTABLE DISINFECTOR.

By MAJOR J. T. WYBOURN,
Royal Army Medical Corps.

CURRENT pressure steam disinfection with downward displacement has been shown, by experience, to be the most reliable method.

Field Hygiene Sections are provided with disinfectors able to deal with 1,000 blankets a day, transported on a 3-ton lorry, which disinfectors are admirable in dealing with the routine disinfection of blankets, bedding and kits of large units.

It is neither practicable nor economical to despatch such apparatus to large units for the occasional disinfection necessary following isolated cases of scabies or other infection. Neither are they suitable to meet the requirements of units comprised of several scattered detachments, viz.: L.A.A. Regiments, S/L units and V.P.s, to mention a few.

What is required for these purposes is a disinfector which is reliable, cheap, easily and speedily assembled, conveniently transported on a light van or 8-cwt. P.U. truck and finally requiring no highly technical knowledge to carry out the work.

This disinfector, it is claimed, meets all these requirements.

The materials necessary for its construction are detailed hereunder :

1 50-gallon drum ; 1 5-gallon drum ; 38 feet 2 inch by 2 inch deal or other seasoned wood ; $2\frac{1}{2}$ feet of 1 inch iron piping ; 4 1 inch by $1\frac{1}{4}$ inch bolts ; 16 $\frac{3}{8}$ inch by $\frac{3}{16}$ inch rivets ; 18 2 inch by 12 inch screws ; 12 3 inch by 12 inch screws ; 8 $3\frac{1}{2}$ inch by $\frac{1}{2}$ inch nuts ; 4 $5\frac{1}{2}$ inch by $\frac{1}{2}$ inch nuts.

Briefly the details of the constructional technique are as follows :

(1) *50-gallon Drum*.—(a) One end of the drum is removed, 1 inch rim of this end is taken away and with a fitted handle is converted into a removable lid with 4 bolts and brackets (fig. 1).

(b) One 6 inch length piping is supported by a cone and fixed to each side of the drum, thus keeping it in position on the brackets.

A further 6 inch length piping is fitted to the closed end of the drum, into the collar already present in drum which is the steam entry of the disinfector.

(2) *5-gallon Drum*.—This is the proposed boiler. First it is assured that it is watertight. Two holes are then bored in one side and fitted with : (a) 6 inch pipe—which acts as steam exit. (b) 1 foot piping—which becomes filler and safety valve.

(3) *Wooden Stands*.—Two stands are constructed, each consisting of two triangles held together by crossbars. The crossbars are half jointed to the triangular ends with 3 inches protruding at each end, as shown in diagram, which gives details of the size.

Excluding labour the total cost of all materials used has been found to be 25s. When packed ready for transport the total weight is 182 pounds.

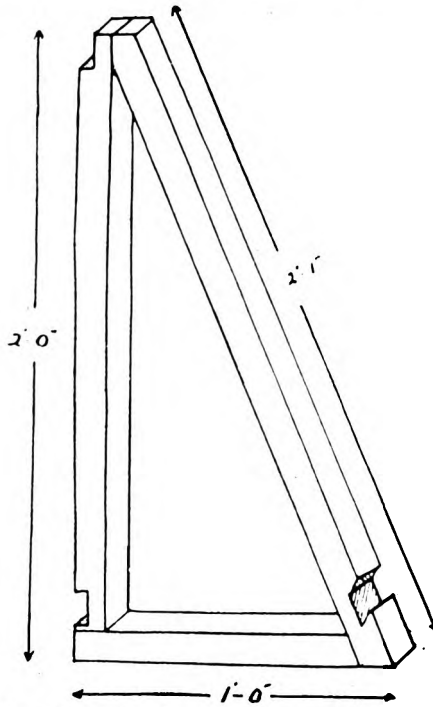


FIG. 3.—Showing shape of stand and position of crossbars. Shaded parts show joints. Joints are screwed together.

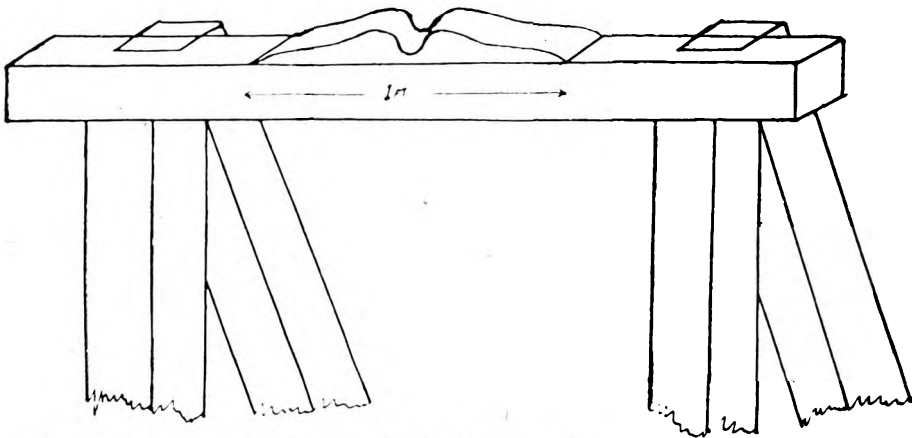


FIG. 4.—Showing bed for spindle, attached for drum to rest into. Lined with tin and screwed to crossbar.

The average time from removal from transport until complete assembly is seven minutes.

During the experimental stage with this model, the time taken for steam to percolate from the entry at the upper end of the drum to the exit at the lower end was estimated to be about twenty-five minutes, due to great loss of heat from the surface of the drum.

By placing a blanket around the disinfector the loss of heat is reduced and it is found in this way that steam is emitted from the bottom of the drum within six minutes of entry. A coal fire or alternatively a Hydra burner is used.

The estimated capacity of the drum is eighteen blankets or six complete kits. It has been tested several times with Temoine tubes and has given completely satisfactory results after three to four minutes' issue of steam, i.e. within ten minutes of entry of steam so disinfection can be conducted three to four times an hour.

Several models of this type have already been distributed to units where they have all proved efficient—being constructed by two carpenters and one tinsmith in one and a half days.

This model has been devised by a Field Hygiene Section and particular indebtedness is paid to the workshop staff who have been responsible for the constructional details under the supervision of the foreman, Corporal B. Stevens, R.A.M.C.

Figs. 1 and 2 show the disinfector packed ready for transport and assembled.

Figs. 3 and 4 show the details of construction of the wooden stands.

Editorial.

TUBERCULOSIS CARRIERS.

WHAT is a "carrier" of disease? When the word was first introduced to describe the state in typhoid ex-patients who continued to excrete bacilli though quite free from manifest disease we, in the Army, were left in no doubt as to the significance of the expression. We recall how, in 1908, we were called upon to investigate six of these unhappy men who had started outbreaks of typhoid while themselves in good health. All had been victims of the disease beforehand and had continued, unknown to themselves or their medical attendants, to pass germs in the urine or the fæces for periods of from six months to two years until, the circumstances being favourable, enteric fever had broken out in their immediate environment and had led to their examination and to the discovery that they were "carriers." Theirs was a hard lot. One was a serjeant well on the way to promotion. Others were or had been cooks. There was a corporal of the Artillery, as fine a soldier as one could wish to see. Treatment was unavailing and all of them were ultimately transferred to civil life and their Medical Officers of Health notified. And the tragic part of it was that there they were treated as lepers and turned from any decent employment that they had been so fortunate as to obtain! What else could be expected? A M.O.H. could not treat them otherwise when he was informed that they had already given rise to one outbreak of typhoid and might at any time give rise to another! And employers, once notified of the truth, were naturally unsympathetic to men who might lead to disease amongst their staff! The mention of the word "carrier" was enough. But what, in fact, is a "carrier"? The word cannot be confined to typhoid fever. The "diphtheria carrier" is sufficiently common to be accepted without demur, though he differs from the "typhoid carrier" in being far more curable than the latter. It is true that he has usually had an attack of the disease beforehand but this is by no means always the case.

We have lately seen letters in the medical press from tuberculosis specialists denying the applicability of the word to tuberculosis and of others asserting it! Which attitude are we to adopt?

Let us state at once that we regard the matter as settled beyond question. Tuberculosis "carriers" not merely exist but they are far too numerous for our safety or our comfort. If the term "disease carrier" means a person in relatively good health but who is excreting the germ, then we must include the "tuberculosis carrier" with the others. On the one hand, we may quote three cases brought to light by Webster in a recent paper in the *British Medical Journal*. These three men were perfectly healthy as

far as anyone could see. They had been examined both by thoroughly good clinicians for physical signs and by the X-ray methods in use in recruiting for the Australian Army. Miniature radiology has led to the detection of a large number of individuals but these cases were quite exceptional in that they were negative even to this most searching of tests ! And yet they were found, on their sputum or gastric secretion being thoroughly examined, to be passing out tubercle bacilli. We ourselves recall a medical student in perfect health, with a lesion only visible in the X-ray film and so small as to be actually missed by a board of experts, who was yet an excreter of tubercle bacilli, a "carrier," not dangerous, perhaps, to normal adults as the number of bacilli was small, but of great danger to children and other susceptible persons. A series of somewhat similar cases has recently been recorded in the *British Medical Journal* in a paper entitled "Origin, Diagnosis and Management of Early Bronchogenic Tuberculosis," by Gregory Kayne. These cases may be regarded as exceptional in that they had not previously suffered from the disease. But what does it matter whether the individual has had previous signs or not as long as he is in good health and yet expectorating the bacilli ? And what of the "completely restored" person who leaves the sanatorium with a fibrotic lung and perhaps with a single negative or, more likely, a positive sputum ? Is his excellent general health to justify, for instance, his admission to the Army ? Such men will try hard to get into the Service and may conceal the fact that they have already had a sanatorium interlude. They may, of course, sometimes do quite well but the great majority is bound to break down again later under the stress of active service or, perhaps, without this stress as they might have done in civil life.

Are we justified in accepting them without a thorough examination ? The soldier may be one of a very crowded community in billets and in shelters or dug-outs ! And in those very conditions the ex-sanatorium patient is likely to break down or at least to start excreting bacilli. This may not be a great disadvantage to him. He is likely to be found out sooner or later by the medical officer and to be returned to civilian life, with the prospect of a pension. But what about the healthy men around him ? Are they or are they not being exposed to an unwarrantable risk ? This will depend on the closeness of the contact, the restriction or otherwise of the billet or space, the length of time and a thousand and one things quite outside any medical control. We say definitely that the risk to these men is considerable and that an exposure of this kind is likely to increase the bill that the nation will have to face in pensions after the war. Nor do we forget that some young soldier may be, even now, inhaling the germ that will strike down his life or his health when he is just about to re-enter the society for which he had longed during his time of exile in his country's service. The tuberculosis "carrier" is not merely a reality but a much commoner reality than is generally supposed.

And how can he be detected ? It is useless to expend clinical skill on a

search which can often defy clinical findings. There is nothing more certain than that the really early case is frequently quite fit and free from physical signs. To detect him one must have recourse to the skilfully taken X-ray picture and to the "reading" that, to be effective, must be made by a very experienced man. And to this "reading" must be added when necessary thorough investigation of the sputum or other material provided. These desiderata are not likely to be found in the rush and hurry of medical boarding. The only hopeful way seems to be by the application of "Miniature Radiology"—to all recruits or as many as possible !



Clinical and other Notes.

CONSTANT HOT WATER IN THE FIELD.

BY CAPTAIN D. B. WALLIS,
Royal Army Medical Corps.

A CONSTANT supply of running hot water in the field must always be a source of great convenience, especially to the Medical Services.

The author has attempted to devise a suitable apparatus made from readily available material to achieve this object.

The apparatus consists essentially of heating element, water reservoir, connecting tubes between reservoir and heating element and a draw-off pipe fitted with a three-way tap.

Heating Element.—This consists of the top and bottom of a non-returnable four-gallon petrol tin which are soldered together. One of the components is cut from the tin, leaving a $\frac{1}{4}$ inch edge all round, beaten diagonally from both corners.

The other component is cut without a free edge of tin, is drilled at each corner with a $\frac{1}{4}$ inch hole and a $\frac{1}{4}$ inch hole drilled centrally, and is then forced inside the lip of the first component, the outside part of each being on the outside.

The two are soldered together around the edge.

Reservoir.—This consists of a four-gallon petrol tin cut in two, the part chosen as reservoir being drilled in each of the four corners with a $\frac{1}{4}$ inch drill and drilled in one side to form a hole approximately the size of the cork which is going to form part of the tap, the hole being approximately $\frac{1}{8}$ inch above the base of the reservoir.

A handle is fitted.

Connecting Tubes.—These connect the heating element with the reservoir. A suitable suggested length is about 2 to 3 inches. The tubes are made in the following manner :

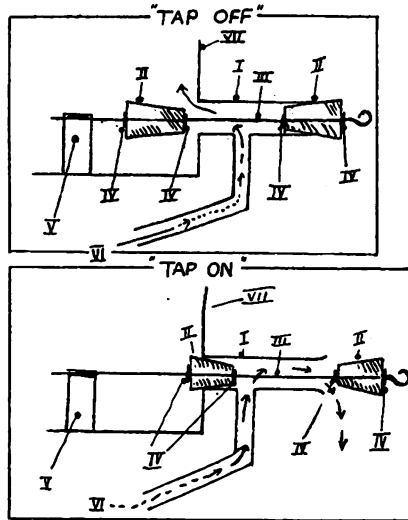
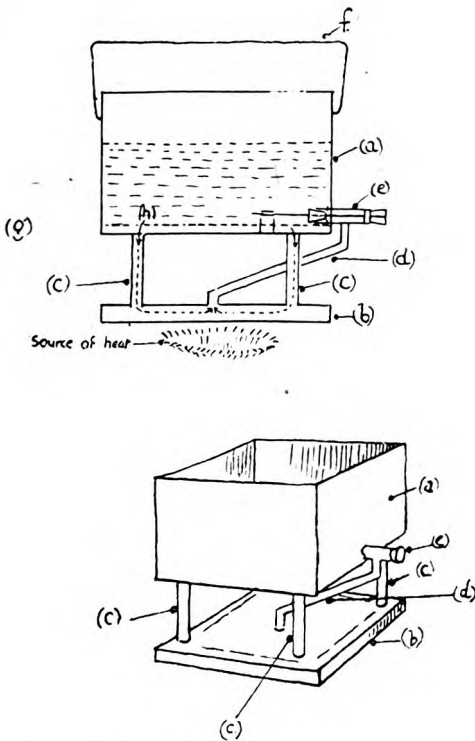
A 6-inch nail which has a diameter of $\frac{1}{4}$ inch is placed in a vice and tin is beaten around the nail with an overlap and soldered. The pipe thus made is cut into two with a hack-saw and the process repeated for further pipes. These pipes are now soldered between the holes made in the heating element and the holes made in the base of the reservoir.

Draw-off Pipe.—This pipe is made from tin rolled round a 6-inch nail and soldered overlapping. A further short length of piping is made, one end of each and either end of the draw-off tube being suitably angulated so that the draw-off pipe starting from the centre of the heating element comes to rest close to the hole made in the side of the reservoir.

The end of the draw-off pipe will be soldered into the tap.

The Tap.—To make the tap the following articles are required : 2 corks of any similar size ; 4 inches of stout wire and some tin.

The tap cylinder is formed by rolling round some suitable hard object such as a large-sized drill and soldering with overlap. The centre of the cylinder is drilled with a $\frac{1}{4}$ inch hole. One end of the cylinder is soldered to the hole in the side of the reservoir and the $\frac{1}{4}$ inch hole is soldered to the draw-off pipe. The stout wire is threaded through the centre of both corks, narrow ends towards each other, the wire being threaded through one cork,



KEY TO DIAGRAMS OF HEATER.

- (a) Reservoir
- (b) Heating Element approx $\frac{1}{4}$ " depth
- (c) Connecting Tubes
- (d) Drawing off Tube
- (e) Three-way Tap
- (f) Handle
- (g) Water Safety Level
- (h) Water Circulation

KEY TO TAP DIAGRAMS.

- I Tin Cylinder
- II Corks
- III Wire joining Corks
- IV Tin Discs soldered to wire to fix Corks
- V Tin Guide for Wire
- VI Water Circulation
- VII Section of Petrol Tin

through the cylinder and through the other cork. Each cork is kept in position by 2 circles of tin which compress the cork and are soldered to the wire so that when one cork is tight in the cylinder the other cork is pushed out of the cylinder. That part of the wire which is outside of the reservoir is formed into a circle to act as a handle and that part of the wire which is inside the reservoir is straight and kept in position by a guide, the guide of tin being soldered to the base of the reservoir.

How it Works.—The apparatus is first filled with water. On applying heat to the heating element it is found that the water circulates up the draw-off pipe to the three-way tap. When the tap is "off" it returns to the reservoir

or when the tap is "on" it is drawn off as required. The temperature of the circulating water within a minute rises to a temperature painful to touch and can be constantly drawn off at the rate of 1 pint per minute. In the "off" position the water circulates, the reservoir becoming progressively hotter if the heat is maintained. As an economy in fuel, however, when not in use the source of heat can be reduced, being turned up when hot water is required.

The total cost of the apparatus is that of the solder, wire and 2 corks.

Practical Use and Findings.—A model similar to the one described has been in use for three to four months for four hours each day without any trouble developing.

As the water in the heating element never quite reaches boiling point, the amount of fur forming is likely to be slight and after three months use no loss in efficiency has been noticed.

Steam and air locks do not develop.

Good circulation is ensured by the drawing-off pipe being led from the centre of the heating element and entering the reservoir higher than the return pipes.

Hot water may be drawn off indefinitely provided the reservoir is replenished with cold water as fast as it empties.

As a source of heat, stoves oil wickless and stoves oil boiling have been used with equally good results. The stoves oil boiling are less trouble in use.

The making of the taps is simple nor does the making of the apparatus require any expert knowledge or ability.

If a brass three-way tap is fitted the internal diameter should be $\frac{1}{4}$ inch. Using this tap, cold, lukewarm or hot water may be drawn off, the water circulating as before in the "off" position.

A diagram is produced to assist in understanding the making and working of the apparatus.

AN IMPROVISED STERILIZER FOR FIELD MEDICAL UNITS.

BY MAJOR W. M. E. ANDERSON, M.B., B.Ch.

Royal Army Medical Corps.

WITH the equipment available in Field Medical Units the sterilization of large articles, such as kidney dishes, is sometimes a problem and, in an attempt to meet the difficulty, a simple type of sterilizer has been constructed from portions of two four-gallon petrol tins. The necessary work was carried out, on practically a "no-cost" basis, in the fitter's shop of a Field Ambulance Company.

As shown in the photographs, the sterilizer consists of three parts, viz., the box, the lid and the tray, with two hand grips.

(a) The box (fig. 1) consists of a petrol tin from which one side and about one-third of the adjoining ends and sides have been removed and the cut edges turned in for about $\frac{1}{4}$ inch. Four-gallon tins have normally a small

which was removed in making the box, the edges being bent up in a 1-inch flange and the corners left unsoldered. About a hundred perforations were made in the base with a $\frac{1}{4}$ -inch punch. The dimensions of the tray are 12 inches by $8\frac{1}{2}$ inches by 1 inch and the wire handles at each end are about 5 inches high. The hand grips of twisted wire, for lifting the tray out of hot water, are about $7\frac{1}{2}$ inches high and 4 inches wide at the base and their circular portion has a diameter of about $3\frac{1}{2}$ inches.

It should be noted that, in the event of the box portion being accidentally burnt out, a new box can be constructed by the fitter in a maximum of ten minutes.

This sterilizer has undergone fairly severe tests and appears capable of standing up to prolonged boiling. In use, each end is supported on three 9-inch bricks, placed side by side and end upwards, which enables a Primus stove to be slipped underneath and removed for filling when necessary.

I have to express my thanks to Lieutenant-Colonel H. B. Trumper, R.A.M.C., for permission to submit this note for publication and to Private F. J. T. Green, R.A.S.C., my Company Fitter, for putting my ideas into concrete form.

THE OIL DRUM GREASE TRAP.

BY MAJOR A. W. STOPFORD THOMPSON,
Royal Army Medical Corps.

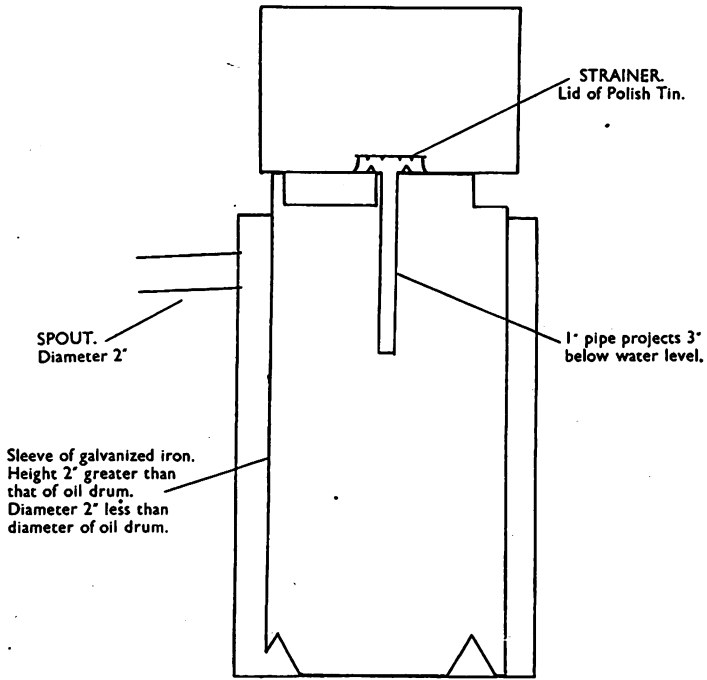
A DIFFICULTY which frequently arises in cook-houses in requisitioned buildings is that standard types of field grease traps are unsuitable for use in a paved yard. The ordinary cold water grease trap, when made with the poor materials available at present, will seldom hold water if it cannot be sunk into the ground. One finds that most units in these circumstances use no grease traps of any kind, with the result that sooner or later the drains become blocked.

The grease trap illustrated in the accompanying sketches is an attempt to overcome this difficulty.

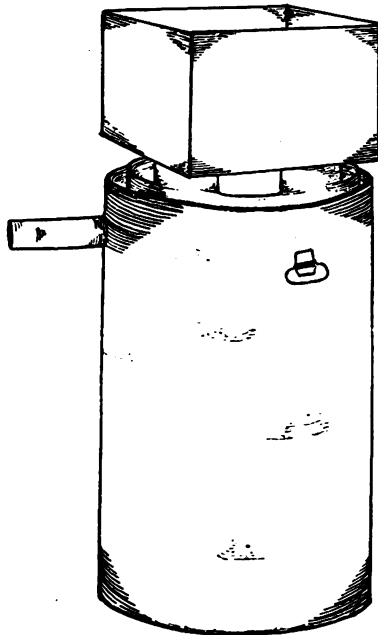
Materials required are a four-gallon petrol tin, half of which becomes the strainer box, the strainer itself being made from the lid of a small tin; a sheet of flat galvanized iron, forming the cylindrical baffle plate; and a five-gallon oil drum. The handles are taken from the petrol tin. In making the baffle plate, it is best to rivet the joint first with three or four nails, and then solder it.

It is unnecessary to use straw or bracken in this grease trap. The object of the narrow tube is to carry the hot water below the grease level. The success of this particular trap depends on its ability to lose heat rapidly, and for this reason it must not be sunk into the ground, and the castellation of the top of the baffle is important.

It has been found in practice to deal satisfactorily with the grease from a cookhouse for forty to sixty men.



Section.



Perspective Drawing.

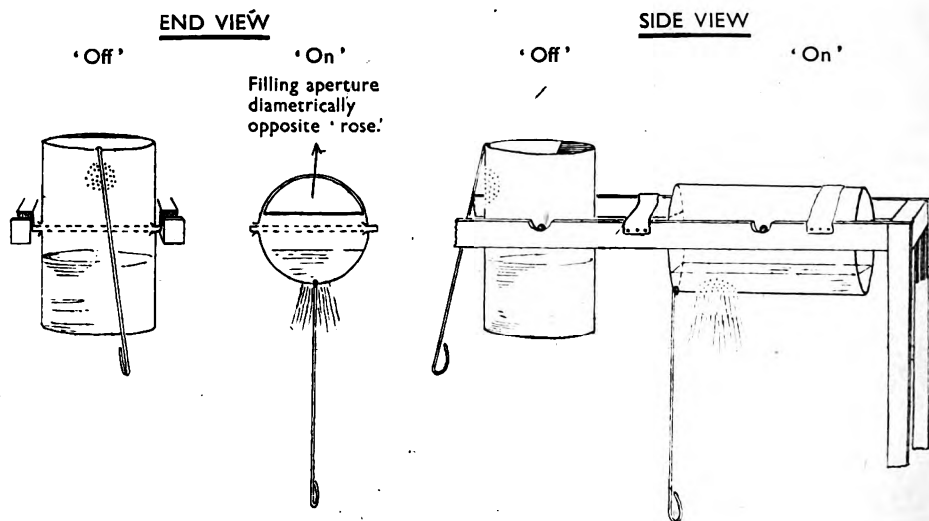
AN IMPROVISED SHOWER.

BY MAJOR A. E. TURNER,
Royal Army Medical Corps.

THE simplest form of shower bath is made by perforating the necessary holes in the bottom of a drum but this was found to be impracticable for the following reasons :

- (1) It was found necessary to have some method of turning " off " and " on " the shower to allow the bather time to lather himself.
- (2) It does not permit the man to fill up and fix his shower before undressing.

The following sketches illustrate how a shower bath can be constructed without the use of skilled labour or special tools ; it can be turned " off " and " on " at will and fixed in position before the bather undresses.



The five-gallon oil drum holds $3\frac{1}{2}$ gallons of water up to the pivot and gives a strong shower for three minutes running continuously.

A fire bar is passed through the drum about 1 inch above the centre of gravity and a strip of camouflage tape is tacked on to the supports, as shown in sketch, to prevent the drum from passing beyond the horizontal. This ensures that the shower swings to the " off " position when the handle is released.

These showers can be set up in rows as required. The hot water can be drawn from Soyer stoves or other improvised water heaters in the five-gallon drum which is lifted into position and is then ready for use.

A STEAMER FOR USE WITH THE SOYER STOVE.

BY MAJOR D. A. LOWE,
Royal Army Medical Corps,

AND

LIEUTENANT AND QUARTERMASTER J. B. SABIN,
Royal Army Medical Corps.

At this time, when economy and fuel is of prime importance, it is thought that a description of a simple steam cooker, at present in use by an R.A.M.C. unit, may be of interest to messing officers and cooks generally.

The steamer is designed for use with the regulation Soyer Stove, is light yet strong, easily cleaned and, in making use of the steam generated in the main container of the stove, allows two items to be cooked at one time. It consists of a round galvanized iron body lipped to fit tightly inside the top of the Soyer Stove. There is a removable lid, two side handles for lifting, and the bottom is perforated to allow the circulation of steam from below.

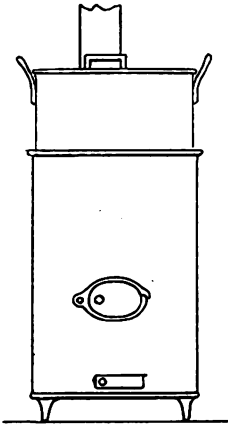


FIG. 1.—Steamer in position.

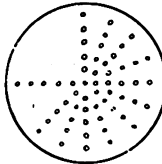


Fig. 2.—Plan of bottom, showing perforations for steam.

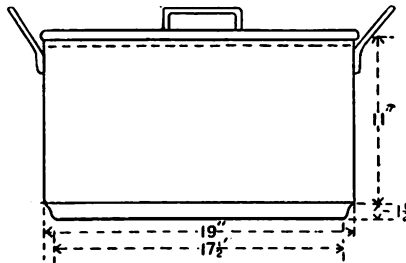


FIG. 3.—Elevation showing detail.

It is capable of cooking 75 to 80 pounds of potatoes or root vegetables in an hour or less, or 60 to 70 pounds of steamed pudding (in suitable containers) in $1\frac{3}{4}$ hours. It has also been found useful for macerating bones in the preparation of stock. The steam liquefies the marrow and loosens the small fragments of meat which fall through the perforations into the liquid below. The cleaned bones, ready for salvage, are left in the steamer.

The steamer was designed by Lieutenant (Quartermaster) J. B. Sabin, R.A.M.C., and was made to specification by Messrs. Newlove of Malton at the cost of £1 8s.

We are indebted to Lieutenant-Colonel J. W. Hyatt, R.A.M.C., for permission to forward these notes.

Current Literature.

JONES, R. R., CROSSON, J. W., GRIFFITH, F. E., SAYERS, R. R., SCHRENK, H. H. & LEVY, E. **Administration of Pure Oxygen to Compressed Air Workers during Decompression: Prevention of the Occurrence of Severe Compressed Air Illness.** *J. Indust. Hyg. & Toxicol.* 1940, v. 22, 427-44, 5 figs. [22 refs.]

The value of oxygen inhalation during decompression as a prophylactic measure against compressed air illness has been tested. Preliminary experiments established the fact that no untoward effects developed during or after the inhalation of 100 per cent oxygen while undergoing decompression.

It was apparent that the gas could be administered in two ways, one in which there would be a constant flow of oxygen and the other in which the oxygen would be automatically supplied during respiration. The latter was considered the more satisfactory because it would meet a wide variation in oxygen demand and at the same time would be more economical. This principle of automatic administration is used in oxygen breathing apparatus, and some of the parts of this equipment were incorporated in the new apparatus. The first device was designed primarily for the administration of oxygen to a single person, as a therapeutic measure during decompression in a medical lock. This apparatus consisted of a reducing valve and breathing bag with admission valve assembly as used in oxygen breathing apparatus, a long breathing tube and a half-mask face-piece. The device was not used as a closed system and the exhaled air escaped through a valve on the face-piece. This apparatus worked satisfactorily and was used as the basis for the first apparatus built for administering oxygen to twelve persons simultaneously. Oxygen from two 220 cu. ft. cylinders of the gas was led through a reducing valve to a rubber breathing bag assembly. From this the oxygen was conducted through large diameter rubber tubing to a 1½ inch galvanized pipe which served as a manifold in which 12 one-inch nipples were placed. Half-mask face-pieces with exhalation valves were connected through flexible breathing tubes to each of the nipples.

In the experimental group 3,884 decompressions with oxygen inhalation were conducted over a three-month period on groups of 12 men in 3 crews. These men were unselected volunteers and they were carefully instructed and supervised throughout. They breathed pure oxygen during the last twenty minutes of each decompression period. No case of bends occurred in this group during the course of the experiment.

In another group, 15,904 decompressions were performed on men who were in the same crews as those of the experimental group, and who decompressed in the same lock at the same time as the oxygen volunteers, but who did not breathe pure oxygen during the decompression period. There were

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21 cases of compressed air illness in this second batch, giving a rate of 1.32 per 1,000 man-decompressions.

In another series of tests using oxygen, 11,196 decompressions were made but 23 cases of compressed air illness were reported (2.05 per 1,000 man-decompressions). In the same chamber at the same time as those that were supplemented with pure oxygen, 9,462 decompressions were also conducted in the regular manner, and these produced 12 cases of illness (1.27 per 1,000 man-decompressions). This result would appear to deny the value of oxygen inhalation during decompression, but a further review of the individual cases reported showed that the oxygen inhalation was more beneficial than it appeared at first sight. Of the 23 cases of compressed air illness during oxygen inhalation, 3 were discounted, and all but 1 of the remaining 20 cases were mild and were all relieved on decompression. In the group which decompressed in the ordinary manner, however, i.e. without the use of oxygen, 5 of the 12 cases of bends were severe. Another important factor appeared to be that the men in the oxygen group were not carefully instructed and supervised throughout the experimental period.

In two further groups of decompressions without oxygen inhalation, 31,254 decompressions produced 70 cases of compressed air illness, and 18,750 decompressions 34 cases of illness. The rates per 1,000 man-decompressions were 2.24 and 1.81 respectively.

In view of the fact that in the first experimental group, 3,884 decompressions with oxygen were conducted without a single case of compressed air illness, it seems reasonable to assume that, with an efficient system of oxygen administration in addition to proper supervision and education of the worker in the use and necessity for utilizing the apparatus, the incidence of compressed air illness can be considerably reduced and that serious cases can be eliminated.

C. G. WARNER.

Reprinted from "Bulletin of Hygiene," Vol. 16, No. 4.

BENJAMIN, B., FLEMING, G. & ROSS, MARY A. **Results of Schick Test in Children One to Ten Years after Injections of Toxoid.** *Amer. J. Dis. Children.* 1940, Dec., v. 60, No. 6, 1304-12. [10 refs.]

The authors traced the persistence of immunity by Schick-testing two to ten years after the injection of diphtheria toxoid. The control injection in the Schick test was made with a 1 : 100 dilution of toxoid. No Schick tests had been done prior to the original immunization. Two doses of toxoid had been injected into 125 children. These now showed an 18.4 per cent Schick-positive rate, while for 1,370 children who had received three doses the positive rate was 7.0, the obvious indication being that three doses are better than two. The children who had received three doses numbered 1,397 and almost all were available for the various analyses. Amongst 1,251 children the percentage found positive ranged from 4.8 per cent in those tested 1-2 years after immunization, to 7.5 per cent for the 4-5 year group; then the figure rose sharply to 14.9 for the group

inoculated 5-11 years previously. The different groups contained from 150 to 300 children. On this sudden rise is based the suggestion that in the sixth year of life all children should receive 1 c.c. of toxoid, or be Schick-tested and be immunized if positive. There was no material difference in the immunizability of the sexes; 668 boys showed a positive rate of 6.4 per cent while for 617 girls the figure was 7.7. The analysis of results in those inoculated at an early age gives interesting figures; 383 children were from six to nine months old when injected. Fourteen (3.6 per cent) had become positive when tested some years later; this figure compares favourably with the 8.3 per cent amongst 662 who were more than one year old when inoculated. The authors point out that diphtheria is met with in the first year of life and that immunization begun at six months may give as good results as those obtained at later ages. In none of 67 children tested a short time after immunization did the Schick reaction revert to positive in less than two years after the third dose of toxoid.

R. A. O'BRIEN.

Reprinted from "Bulletin of Hygiene," Vol. 16, No. 4.

TALBOT, H. P. **Four Years of Premarital Blood Tests.** *Med. Officer.* 1940, Dec. 14, v. 64, No. 24, 201.

The results of the premarital blood tests which have been carried out in Connecticut, U.S.A., in accordance with the law which came into operation in 1936 were as shown in the following table, constructed from one in the original paper:

RESULTS OF THE CONNECTICUT PREMARITAL BLOOD TEST LAW.

	1936	1937	1938	1939
Males reported positive ..	36	59	108	111
Females " " ..	45	53	88	96
	81	112	196	207
Certificate marked non-communicable ..	37	52	116	145
Marriage not sanctioned ..	44	60	80	62

In the first year of the law the marriage rate fell considerably, but has since recovered, and in 1939 was higher than in any year since 1932. This may account for the larger number of positives found in 1939, but it should be noted that the number of cases in which sanction was withheld did not rise. This is attributed partly to a better understanding of the intention of the law on the part of the medical profession, and to "the suggested protection to the physician and patient by the physician requiring a signed statement from prospective applicants (particularly in young females) that they relieve the physician of responsibility in signing the certificate and agree to remain under treatment as outlined." A significant decrease in reports of cases of congenital syphilis under one year of age is attributed to the pre-

vention of marriage of infectious persons, or to steps to insure their treatment, the numbers of such cases from 1936 to 1939 were respectively 38, 24, 16, and 11. At the end of 1939 the number of States in the U.S.A. which had passed premarital blood tests laws was nineteen.

L. W. HARRISON.

Reprinted from "Bulletin of Hygiene," Vol. 16, No. 4.

MUIR, E. **Some Basic Principles in Leprosy Treatment.** *Leprosy Review.* 1940, Oct., v. 11, No. 4, 162-169.

After emphasizing the high resistance of the tissues with intense cellular reaction in nerve cases, compared with the absence of resistance in the lepromatous type, the author states that in the latter type the two objectives are to strengthen and stimulate the tissue cells to act more vigorously in breaking down the defence of the bacilli. These principles are the basis of his oft-recommended measures to improve the general health by regular exercise, etc. Local applications of caustics, such as trichloroacetic acid, intradermal injections of hydnocarpus oil, the exact action of which is not fully understood, and nutritious diet are also advised. Potassium iodide, in small doses at first, is stated to have a specific effect in breaking down the defence mechanism of the bacilli. Fluorescein in 10 grain doses daily for seven months, methylene blue, 4 grains for six months, or trypan blue, 4 grains for over one month, are also recommended, but he does not advise massive doses of these dyes.

L. R.

Reprinted from "Tropical Diseases Bulletin," Vol. 38, No. 4.

CAPON, P. J. L. **A Brief Investigation regarding the Height above Sea-level at which Malaria occurs in Baluchistan.** *Jl. Malaria Inst. of India.* 1940, June, v. 3, No. 1, 125-127.

An outbreak of malaria occurred among British troops encamped at Kahan Tangi in Baluchistan, 6,500 feet above sea-level. Previously it was thought that the altitude precluded the possibility of malaria transmission. The author made an inquiry in a number of villages situated at heights varying from 6,200 to 8,000 feet; spleen examinations were made and sick persons were examined. It would appear that in this region malaria transmission ceases at a height of about 7,000 feet.

N. W.

Reprinted from "Tropical Diseases Bulletin," Vol. 38, No. 4.

MUIR, E. **Intranasal Treatment in Leprosy.** *Leprosy Review.* 1940, Oct., v. 11, No. 4, 173-175.

The author advises (1) mild antiseptic treatment on the lines recommended by Parkinson, namely irrigation of the nasal cavities with normal saline with the aid of a pipette while the patient lies sideways on a couch. If there is much nasal catarrh 0.9 per cent ephedrine hydrochloride should be added to the saline. (2) If there is severe sepsis with pus and

crusts, the same treatment is advised with longer retention of the saline to soften the crusts, or sodium sulphate may be used up to 10 per cent strength. (3) For dealing with leproma, cauterization with trichloroacetic solution is advised in a 10 per cent solution after the mucous membrane has been anaesthetized with a spray of 2 per cent novocain, and repeated after two weeks. Treatment diminishes the discharge of lepra bacilli from the nose.

L. R.

Reprinted from "Tropical Diseases Bulletin," Vol. 38, No. 4.

HERTIG, MARSHALL. Glass Tubes for Rearing Phlebotomus and Other Insects. *Science.* 1940, July 26, v. 92, No. 2378, 91-92. With 1 fig.

"All methods of rearing sandflies in the laboratory involve keeping the engorged females at a high degree of humidity in a vessel with a moist inner surface on which the eggs may be laid." The authors fill one end of a tube (of length 8 cm. and bore 8 to 9 mm.) with plaster of Paris, which extends into the tube for 10 to 12 mm. The open end is stoppered with cotton. These tubes may be made in quantity by standing bundles of cut tubing in dishes of freshly mixed plaster. Before use the plaster is moistened by contact with wet cotton and when containing sandflies the tubes are stored, plaster end down, in moist earthen pots or in pans with a thick bottom layer of plaster. The highest degree of moisture short of condensation on the glass walls is desired. Eggs may be immersed in water and transferred to a breeding pot by pipette.

These tubes may also be used as containers for transporting sandflies and for the breeding of fleas.

C. W.

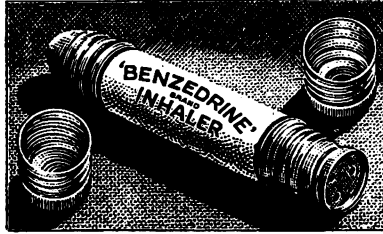
Reprinted from "Tropical Diseases Bulletin," Vol. 38, No. 4.

Reviews.

NEURO-OPHTHALMOLOGY. By L. Lindsay Rea, B.Sc., M.D., M.Ch., F.R.C.S. Second Edition. London: W. Heinemann (Medical Books), Ltd. 1941. Pp. 688 with 196 illustrations and 22 colour plates. Price 50s.

The second edition of Lindsay Rea's *Neuro-Ophthalmology* adopts the rather unusual procedure of incorporating the additions to the subject-matter in the Second Edition as an appendix of 110 pages at the end of the original edition. The absence of any omissions from the first edition makes the second much bulkier, a tendency which, if the plan is persevered with in subsequent editions, will have obviously inconvenient results. Moreover, it is annoying, after reading a section in the main body of the book, to find at the end that the information there laboriously absorbed is wrong and out of date. Neither section—the new or the old—is thus complete and, while cross reference may be possible at this stage, it is to be hoped that in later editions the author will re-write the original sections which have

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become obsolete with the passage of time. Apart from this there is some repetition in the book and small discrepancies : for example, it is disturbing to be told on one page that papilloedema should not be confused with optic neuritis only to find that the author commits this mistake on another page.

On the whole, however, the volume is full of valuable information both for the ophthalmologist and the neurologist and, although one would have preferred more decided views in an authoritative textbook on some subjects such as the valuelessness of excision of the cervical sympathetic for pigmentary degeneration of the retina, it fills a considerable want in the literature. The book is well produced, excellently illustrated and among its valuable features not least are the bibliographies.

FOOD VALUES IN WAR TIME. By Violet G. Plimmer. London : Longmans, Green & Co. 1941. Pp. 80. Price 1s. net.

The balanced diet and its scientific basis ; good and bad feeding habits in the past ; experience in the War of 1914-18 ; present-day food problems and their solution.

About these matters Mrs. Plimmer writes in a manner which will interest and instruct and we recommend this booklet as more than a popular discussion of a subject which is of national importance at the present time.

A. E. C.

THE EARLY TREATMENT OF WAR WOUNDS. By William Anderson, *O.B.E.*, M.B., Ch.B., F.R.C.S. Oxford University Press. London : Humphrey Milford. 1941. Pp. viii + 89. Price 5s. net.

This little book is based largely upon experience gained in the 1914-1918 war and it is as well, in our ready acceptance of modern methods, not to forget the lessons learnt in those not far distant days. It is safe to assume, however, that even younger men, working in air-blitzed cities, have already had to deal with problems and circumstances more difficult even than those of the "dimly lighted dug-out dressing station, the dust, the mud, the noise, the crowds of wounded, the appalling wounds, etc.," portrayed by the author.

The book, however, contains information which will prove of value to the youthful medical officer bound for operation areas where war is war as it used to be.

SURGERY OF MODERN WARFARE. Parts I to V. Edited by Hamilton Bailey, F.R.C.S. Edinburgh : E. & S. Livingstone. 1941.

Compiled by sixty-five contributors. Issued in five parts, now obtainable in one bound volume with title page, preface, list of contributors, contents, and comprehensive index, 8vo, 928 pp., with 828 illustrations, many of which are in colour. Price 75s. net. Part I: Section I, Wounds, General Considerations ; Section II, Wounds, Special Considerations.

Part II : Section II continued ; Section III, Wounds of the Trunk ; Section IV, Wounds of the Blood-vessels. Part III : Section IV continued ; Section V, Peripheral Nerve Injuries and Wounds of Tendons ; Section VI, Methods of Immobilizing the Limbs ; Section VII, Wounds of the Hand and Foot ; Section VIII, Wounds of the Bones and Joints. Part IV : Section VIII continued ; Section IX, Wounds of the Face and Neck, including those of the Special Senses. Part V : Section IX continued ; Section X, Wounds of the Central Nervous System and its Coverings ; Section XI, Surgical Diseases encountered in the Subtropical Countries ; Section XII, Administration ; Section XIII, Appendix.

The method of publishing this work in five consecutive parts has much to commend it, particularly as the parts are small and can be conveniently read. The reader would have been happier had two of the volumes not ended in the middle of sentences.

The editor, contributors, and publishers are to be congratulated on the result of their labours. The task of editing the articles of sixty-five authors has been exceedingly well done. The contributors, each a recognized authority, have written articles which are terse but not dogmatic. The contributions are almost without exception comprehensive and stimulating. The publication has been exceedingly well laid out, the illustrations are of uniform fine quality and the print is most readable.

Of special note are the sections and articles dealing with Tetanus, Tendon Suture, Intestinal Injuries, Wounds of the Blood-vessels, and Wounds of Bones and Joints. The section on Wounds of the Face and Neck and Special Senses is excellent and most timely. Plaster technique and methods of splinting the limbs are extremely well described. Extension in a Thomas' splint by means of a boot calliper has not been mentioned in spite of its being such an improvement on other methods.

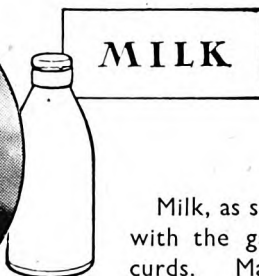
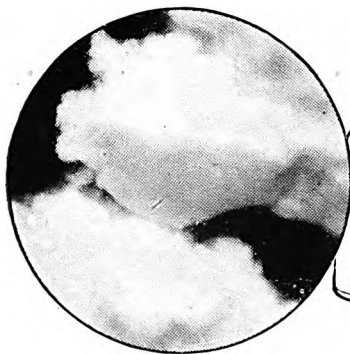
Much valuable work in the field of traumatic surgery and the repair of injured organs has been accomplished since the outbreak of this war and the greater part is here recorded. The stimulating effect of these excellent articles will undoubtedly appeal to all surgeons and they will give an invaluable impetus to future investigation and achievement.

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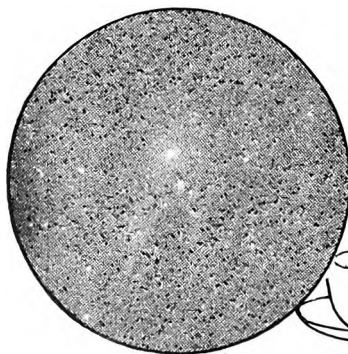
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EXTRACTS FROM THE "LONDON GAZETTE."

July 1.—The KING has been graciously pleased on the occasion of the Celebration of His Majesty's Birthday, to give orders for the following promotions in, and appointments to, the Most Honourable Order of the Bath :

To be Additional Members of the Military Division of the Third Class, or Companions of the said Most Honourable Order :

Major-General Robert Cecil Priest, M.D., F.R.C.P., K.H.P., late Royal Army Medical Corps.

The KING has been graciously pleased, on the occasion of the celebration of His Majesty's Birthday, to give orders for the following promotions in, and appointments to, the Most Excellent Order of the British Empire :

To be Additional Officers of the Military Division of the said Most Excellent Order :

Major (temporary Lieutenant-Colonel) William Ralston Duncan Hamilton, M.B., Royal Army Medical Corps.

To be Additional Members of the Military Division of the said Most Excellent Order :

Lieutenant (Quartermaster) Joseph John Bicknell, Royal Army Medical Corps.

Lieutenant (temporary Major) George Jameson-Carr, M.B., Royal Army Medical Corps.

Captain (Quartermaster) Watkin Norman Maddy, late Royal Army Medical Corps.

July 8.—The KING has been graciously pleased to give orders for the following appointments to the Most Honourable Order of the Bath, in recognition of distinguished services in the Middle East during the period December, 1940, to February, 1941 :

To be Additional Members of the Military Division of the Third Class, or Companions of the said Most Honourable Order :

Colonel (temporary Major-General) Percy Stanley Tomlinson, D.S.O., M.R.C.P., late Royal Army Medical Corps.

Sept. 19.—Col. W. B. Rennie, M.C., M.B. (11015) (late R.A.M.C.), having attained the age for retirement, retires and remains empld. Sept. 20, 1941.

Lt.-Col. (temp. Col.) N. Cantlie, M.C., M.B., F.R.C.S. (4217), from R.A.M.C., to be Col. Sept. 20, 1941, with seniority Oct. 6, 1938.

Maj. (temp. Lt.-Col.) L. B. Clarke (15665), to be Lt.-Col. Sept. 20, 1941.

Sept. 23.—Col. (temp. Brig.) W. Bisset, M.C., M.B. (15684) (late R.A.M.C.), having attained age for retirement, retires Sept. 24, 1941, and remains empld.

Lt.-Col. E. A. P. Brock (8569), from R.A.M.C., to be Col. Sept. 24, 1941, with seniority Jan. 1, 1938.

Maj. (temp. Lt.-Col.) J. C. Denvir, M.B. (19372), to be Lt.-Col. Sept. 24, 1941.

Sept. 26.—Col. W. A. Frost, O.B.E., M.B. (615), (late R.A.M.C.), retires on ret. pay on account of ill-health. Sept. 27, 1941.

Lt.-Col. E. Phillips, D.S.O., M.C., M.B. (8555), from R.A.M.C., to be Col. Sept. 27, 1941, with seniority Nov. 17, 1938.

Maj. J. E. Brooks, M.B. (24829), to be Lt.-Col. Sept. 27, 1941.

Sept. 30.—Col. (temp. Brig.) A. D. Stirling, D.S.O., M.B. (4623), (late R.A.M.C.), retires Sept. 30, 1941, and remains empld.

Lt.-Col. (temp. Col.) S. D. Reid, M.B. (5716), from R.A.M.C., to be Col., Sept. 30, 1941, with seniority Nov. 22, 1938.

Maj. (temp. Lt.-Col.) W. J. Robertson, M.B. (14375), to be Lt.-Col. Sept. 30, 1941.

Lt. (Qr.-Mr.) H. W. Reeves (66209), to be Capt. (Qr.-Mr.) Oct. 1, 1941.

Oct. 3.—Lt.-Col. S. P. Sykes, M.B. (18796), at his own request, reverts to the rank of Maj. whilst empld. during present emergency. Sept. 8, 1941.

Oct. 7.—Lt.-Col. (temp. Col.) E. A. Sutton, M.C. (8525), from R.A.M.C., to be Col., Oct. 8, 1941, with seniority Dec. 30, 1938.

Maj. & Bt. Lt.-Col. (temp. Lt.-Col.) F. C. Tibbs (15776), to be Lt.-Col. Oct. 8, 1941.

Oct. 10.—Col. H. C. Winckworth (127), ret. (late R.A.M.C.), at his own request, reverts to the rank of Lt.-Col. whilst empld. during the present emergency. Aug. 28, 1941.

Oct. 14.—The undermentioned (late R.A.M.C.), retire on ret. pay. Oct. 13, 1941 :

Maj.-Gen. A. D. Fraser, *D.S.O.*, *M.C.*, *M.B.*, *K.H.S.* (11112).

Maj.-Gen. (supernumerary) R. C. Priest, *C.B.*, *M.D.*, *F.R.C.P.*, *K.H.P.* (14073).

Col. (actg. Maj.-Gen.) C. M. Finny, *O.B.E.*, *M.B.*, *F.R.C.S.*, *K.H.S.* (8132) (late *R.A.M.C.*), to be Maj.-Gen. Oct. 13, 1941.

Col. (temp. Brig.) G. Wilson, *O.B.E.*, *M.C.*, *M.B.*, (26291) (late *R.A.M.C.*), to be actg. Maj.-Gen. Oct. 13, 1941.

The undermentioned Lt.-Cols., from *R.A.M.C.*, to be Cols. Oct. 13, 1941:

F. D. Annesley, *M.C.* (8422), with seniority Mar. 18, 1939.

C. D. M. Buckley, *M.C.*, *M.B.* (22509), with seniority Mar. 20, 1939.

Maj.-Gen. R. C. Priest, *C.B.*, *M.D.*, *F.R.C.P.*, *K.H.P.* (14073), relinquishes the appt. of Insp. of Med. Servs. Oct. 13, 1941.

The undermentioned Maj. to be Lt.-Cols. Oct. 13, 1941:

(Temp. Lt.-Col.) F. R. H. Mollan, *M.C.* (5666).

G. O. F. Alley, *M.C.*, *M.D.* (14138).

Maj.-Gen. R. C. Priest, *C.B.*, *M.D.*, *F.R.C.P.* (14073), ret. pay, at his own request, reverts to the rank of Col. whilst empd. during the present emergency. Oct. 13, 1941.

Oct. 17.—Maj. J. M. Morrison, *M.B.* (15603), retires on ret. pay on account of ill-health. Oct. 4, 1941.

Maj. F. P. M. Anderson, *M.B.* (35616), to take rank and precedence in his Corps and in the Army, as if his appt. as Maj. bore date July 27, 1937.

Lt. (Qr.-Mr.) F. T. Catton (66318), to be Capt. (Qr.-Mr.) Oct. 16, 1941.

Regular Army Reserve of Officers.

Oct. 17.—Maj. J. Hare, *O.B.E.*, *M.D.*, *F.R.F.P.S.* (26292), ceases to belong to the Res. of Off. on account of ill-health, Oct. 18, 1941, and is granted the rank of Lt.-Col.

THE ARMY DENTAL CORPS.

Oct. 14.—Maj. A. A. McMullan (34239), is removed from the Res. of Off. Sept. 15, 1941, under the provs. of Art. 716a, Royal Warrant for Pay and Promotion, 1940.

Oct. 17.—Maj. (temp. Lt.-Col.) H. J. Higgins (15754), to be Lt.-Col. Oct. 17, 1941.

QUEEN ALEXANDRA'S IMPERIAL MILITARY NURSING SERVICE.

Sept. 19.—Matron (Act. Principal Matron) Miss M. Loughnan, *R.R.C.*, to be Principal Matron. Sept. 18, 1941.

The undermentioned Sisters (temp. Matrons) to be Matrons:

Miss G. Miller, *A.R.R.C.* Sept. 12, 1941.

Miss A. McC. Summerfield. Sept. 18, 1941.

Oct. 14.—Matron Miss H. M. Jones, *R.R.C.*, retires on ret. pay. Sept. 17, 1941.

Sister (temp. Matron) Miss S. A. Perry, to be Matron. Sept. 17, 1941.

BRITISH RED CROSS SOCIETY—PRISONERS OF WAR DEPARTMENT.

THE Officers of the Royal Army Medical Corps have made a further donation of £100

to the British Red Cross Society, Prisoners of War Department, making a total of £300.

ROYAL ARMY MEDICAL CORPS AND THE ARMY DENTAL CORPS COMFORTS GUILD.

THERE has not been much to report since the last issue of the JOURNAL. A further contribution is being sent to our Prisoners of War this month and also a sum earmarked for books and games. The amounts will be voted at the next Committee Meeting.

We have this week received several letters from the Middle East from Field Units, to whom we despatched parcels in February

last. We were very glad to hear of their safe arrival and that the men seemed so pleased with them. Parcels have been sent every month since then, and we have now sent a parcel to every unit in the Middle East.

The Committee will be very glad to hear from any newly formed units, or those under orders to proceed overseas, who would like

books and games, and woollies too, where necessary.

We still want more knitters and can supply wool to parties, coupon-free and without cost, provided the garments are returned to the Headquarters Mess. Applications for wool

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DEATHS.

GILL.—On Aug. 27, 1941, Captain H. Gill, The Army Dental Corps. Qualified as L.D.S., Sheffield, in 1934, and before joining the Army held the appointment of Honorary Assistant Dental Surgeon to the Barnsley Beckett Hospital. He was commissioned as Lieutenant in the Army Dental Corps on Aug. 12, 1940, and promoted Captain a year later. Captain Gill, who was 36 years of age, leaves a widow and a small son to whom we extend our deep sympathy.

TOWNEND. On Aug. 28, 1941, Captain A. F. Townend, The Army Dental Corps, at the age of 29 years. He was educated at Bradford and qualified as L.D.S., Leeds, in 1935. He was commissioned as Lieutenant in The Army Dental Corps on June 4, 1940, and promoted Captain on June 4, 1941. Captain Townend was unmarried.

BARNETT.—On Aug. 31, 1941, in Beaconsfield, Lieut.-Colonel Kennet Bruce Barnett, R.A.M.C., retired. Born in Holywood, Belfast, Sept. 22, 1867, he was educated at Queen's College, Belfast and took the M.B., R.U.I., in 1892, and the F.R.C.S.I., in 1904. He entered the Service as Surg. Lieut. Jan. 29, 1894, and was promoted Surg. Capt. Jan. 29, 1897. Becoming Major R.A.M.C. Oct. 29, 1905, he was promoted Lieut.-Colonel Mar. 1, 1915, and retired Sept. 5, 1919. He contributed articles to the *JOURNAL OF THE ROYAL ARMY MEDICAL CORPS*, the *British Medical Journal* and *Indian Medical Gazette*. He compiled the Handbook on military sanitation for regular officers in 1912. He served on the North West Frontier in the Tirah Expedition of 1897 and was awarded the medal with two Clasps, having taken part in the action at Dargai, capture of the Sampagha and Arhanga Passes and operations in the Bazar Valley Dec. 25 to 30, 1897. In 1914 and 1915 he served in France and in 1917 and 1918 in Macedonia. He was awarded the 1914 Star, the British War and Victory Medals.

WOOD.—On Sept. 27, 1941, Colonel Leonard Wood, late R.A.M.C., retired, of the Garth, Westbury, Wilts. Born in Utttoxeter on July 30, 1874, he was educated at Wellington College, Berkshire, and took the M.R.C.S. and L.R.C.P. London, in 1898. Commissioned Lieut. R.A.M.C. July 27,

1899, he was promoted Capt. July 27, 1902, Major, April 27, 1911, Lieut.-Colonel, March 1, 1915, Colonel, June 1, 1926, and retired June 1, 1930.

He was Adjutant, School of Instruction, East Lancashire Division, T.F. from Oct. 30, 1908 till Oct. 1, 1911, and on promotion to Colonel in 1926 he became D.D.M.S., Egypt and the Sudan, and was D.D.M.S., Scottish Command, from Dec. 8, 1926, till he retired. After retirement he held the retired pay appointment at Trowbridge from Jan. 1, 1932 till July 28, 1939. In the South African Campaign he took part in the Relief of Kimberley, operations at Paardeberg and action at Dreifontein earning the admiration of all ranks and being recommended for some special recognition of his services. He received the Queen's Medal with three Clasps and the King's Medal with two Clasps. He served in Mesopotamia from the latter part of 1915 till April 1917, being awarded the 1914-15 Star, British War and Victory Medals.

O'CONNELL.—On Oct. 2, 1941, in West Moors, Dorset, Colonel David Valentine O'Connell, late R.A.M.C., retired. Born in Cahirciveen, Co. Kerry, Feb. 13, 1858, he was educated at Queen's College, Galway, and graduated M.D. in 1881 and M.Ch. in 1882 at the old Royal University of Ireland. He took the D.P.H., Cambridge, in 1893. Gazetted Surgeon Feb. 2, 1884, he was promoted Surgeon-Major Feb. 2, 1896, Lieut.-Colonel R.A.M.C., Feb. 2, 1904, and retired Feb. 13, 1913. Recalled Nov. 6, 1914, he was made Brevet Colonel June 3, 1917, and relegated to unemployment April 16, 1919. On Nov. 23, 1920, he was appointed to the retired pay appointment at Bury St. Edmunds. During the operations in Crete in 1897 he was in charge of a Field Hospital at Candia. He married the granddaughter of Inspector General James Forbes, M.D., founder of the R.A.M.C. H.Q. Mess, who served in the retreat to Corunna. His son Lieut. John Forbes O'Connell, R.A.M.C., was killed in action at the battle of the Aisne in 1914.

DAVIDSON.—In Aberdeen on Oct. 12, 1941, Lieut.-Colonel Hugh Allan Davidson, D.S.O., R.A.M.C., retired. Born in Aberdeen May 25, 1875, he graduated M.B.

there in 1900. He entered the R.A.M.C. Nov. 29, 1900. Promoted Capt. Nov. 29, 1903, Major Aug. 29, 1912, and Lieut.-Colonel Sept. 13, 1918; he retired April 29, 1920. He served in France from Sept. 1915 till the end of the war. Twice mentioned in despatches he was awarded the French War Cross and *D.S.O* and Bar; the Bar to the *D.S.O* was awarded for

conspicuous gallantry and devotion to duty. When in command of his unit he maintained the advanced dressing station in spite of heavy shelling by the enemy, only withdrawing when ordered to do so. He visited the Regimental Aid Posts under heavy shelling, and by his example and energy many casualties were evacuated which otherwise might have been lost.

EDITORIAL NOTICES.

The Editor will be glad to receive original communications upon professional subjects, travel, and personal experiences, etc. All such articles or papers, etc., intended for publication must be submitted in **duplicate** through the proper channels, i.e., Commanding Officer and A.D.M.S., or D.D.M.S., to the Under-Secretary of State, War Office (P.R. (O)), and not to A.M.D.2, otherwise such articles are liable to be returned to the authors and this may cause delay in publication.

Correspondence on matters of interest to the Corps, and articles of a non-scientific character, may be accepted for publication under a *nom-de-plume*.

All Communications or Articles accepted and published in the "Journal of the Royal Army Medical Corps," will (unless the Author notifies at the time of submission that he reserves the copyright of the Article to himself) become the property of the Library and Journal Committee, who will exercise full copyright powers concerning such Articles.

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Reprints or excerpts, additional to the above, can be furnished on payment if specially ordered at the time of submission of the article for publication.

Except as in the first paragraph above, communications in regard to editorial business should be addressed—"The Editor, JOURNAL OF THE ROYAL ARMY MEDICAL CORPS, A.M.D.5, Hobart House, Grosvenor Place, S.W.1."

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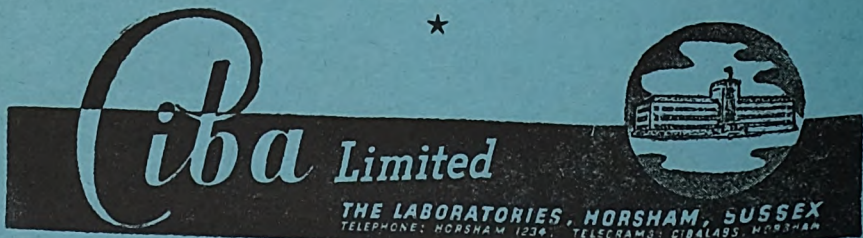
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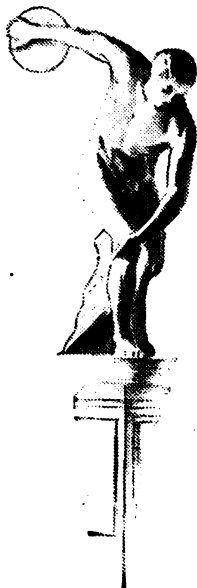
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Original Communications.

MEMORANDUM ON WAR SURGERY AT THE
53RD GENERAL HOSPITAL, SUDAN.
JANUARY 1941—APRIL 1941.

BY MAJOR R. STUPPELL, F.R.C.S.,
Royal Army Medical Corps.

FOREWORD.

HERE is an article which cannot fail to be of interest, to surgeons in particular, especially when it is appreciated that it is written by a young surgeon who worked alone in a somewhat isolated small base general hospital, the establishment of which carries but one surgical team. Major Stuppell, obviously, has had sound surgical training together with some experience in traumatic surgery as seen in civil practice and here you will find described in a frank and interesting manner his reactions to the problems connected with the treatment of the first battle casualties he had to deal with. His cases reached him four days after being wounded so that he could make little use of the many valuable communications to the medical press on the early treatment of wounds which have appeared since the war started and he had, rather, to work out his own lines in treatment. It is possible to follow his reasoning and to appreciate his reactions. Others who have had to face or may still face such problems will surely find this article useful and instructive.

A few passing comments may not be out of place and it is believed that such will in no way detract from the excellence and value of the memorandum.

It is noteworthy that in this series of 311 cases, 43 were complicated by fracture. This gives a percentage of 13·8, which is exactly the same figure as reported in an analysis of 200,000 wounds in the Great War.

The 53rd General Hospital was a long way behind the fighting line at that time and it is not surprising that no abdominal cases reached it ; those which had not already succumbed were obviously retained in medical units nearer the line. The terrain over which the fighting was taking place at that time was an exceedingly difficult one but supplies of sulphonamide were available and it is a matter for surprise that it was not freely used as was the case in the Western Desert.

The points the writer makes on free drainage and adequate immobilization are worthy of note but surely as much credit, if not more, is due to Winnett Orr as to Trueta in this respect ?

It is suggested that small repeated whole blood transfusions, rather than serum alone, would have been better for the anæmia which accompanies large weeping wounds.

X-ray Apparatus.—Supplies of apparatus are now available. The policy in this Command, and one based on the experience of many disappointing if not tragic results, has always been to discourage primary suture unless the case is dealt with really early and under suitable conditions.

Air replacement after aspiration of a hæmothorax. In my opinion 500 c.c. is rather a large amount.

D. C. MONRO, *Colonel*
(*Consultant Surgeon, Middle East*).

I.

OUR first battle casualties arrived on January 20, and we ceased working on April 8, so that our records cover a period of eleven weeks.

During that time 311 casualties were admitted and 285 operations were performed upon them.

It took approximately four days for casualties to reach us from the front line, at first through a C.C.S. and later through a General Hospital in addition.

The majority of wounds were due to splinters of metal in the lower limb followed, next in order of frequency, by similar wounds in the upper limb.

Wounds in the lower limb were complicated by a fracture of the femur in three cases ; by fracture of the tibia and/or fibula in eight ; by fracture of the bones of the foot in five and by a penetrating injury of the knee-joint in three.

Wounds of the upper limb were associated with fracture of the humerus in eight cases, of the radius and/or ulna in six and of the bones of the wrist and hand in seven.

The spinal cord was injured in three cases, the skull in six, large blood-vessels in two, important peripheral nerves in four, and the chest was perforated in seven cases. No perforating wound of the abdomen reached us.

Five deaths occurred. Two were in Italian Prisoners of War who were admitted in a condition of impending dissolution. One had been shot in the head and survived for only half an hour after admission. The other had an open pneumothorax and lived for two hours after admission. These cases may reasonably be excluded from our figures, producing a mortality rate of 1 per cent for all admissions. The three fatal cases will be described in detail in their respective sections later.

The first cases to arrive had been dressed and roughly splinted but no surgical treatment had been carried out. A large proportion of them had been given sulphonamide by mouth for periods varying from one to three days but we never received any patients whose wounds had been treated by local sulphonamide pack nor did I ever try this line of treatment myself.

Later in the campaign we began to receive cases which had had early excision of the wound but I cannot recall more than three or four who did not require further attention to the wound, such as *débridement* or excision of necrotic tissue.

Almost all the wounds, when we received them, were infected and the patients febrile on admission. Those who had fractures were in pain because of the incomplete immobilization of the bone fragments in inadequate splints in the early stages of the campaign but, later, cases began to arrive in plaster casts and these were strikingly free from discomfort.

When our first convoy arrived—it was in the evening—they were at once given pre-medication and taken to the theatre that night, so that the theatre staff worked during the whole of the night until the following morning.

I subsequently realized that this expedition was unnecessary and future cases were left for the night, with a sedative if necessary, and dealt with on the following morning.

As a matter of fact, most of the casualties were so tired and exhausted on admission after travelling for about four days that they fell asleep as soon as they were put to bed.

I can recall only one case which really needed immediate treatment on admission and that was a patient whose anterior tibial artery had been shot through and who began to bleed afresh.

We saw no case of gas gangrene or tetanus. Every wounded man on admission was given 3,000 units of A.T.S. if there was no record on his card of his having already received it.

II.

The wounds with which we had to deal fell into four groups :

(1) Through and through bullet wounds with a small point of entry and exit—of the “leech bite” type.

(2) Through and through splinter wounds with a small point of entry and a large ragged point of exit.

(3) Perforating splinter wounds with a minute point of entry and a large lacerated cavity within the limb, out of all proportion to the size of the wound on the skin.

(4) Lacerated tangential wounds with considerable destruction of tissue.

In wounds of the first group, two possibilities might arise: (a) They might be practically sterile and heal almost by first intention with very little systemic disturbance or (b) the bullet track might be filled with blood-clot. In this event, if the blood was not evacuated early, after a few days the hæmatoma became infected and the wound painful with a general febrile reaction. In these cases it was sufficient to draw a piece of gauze through the track and so clear out the old blood clot. The wound then settled down and healed well.

The closed plaster method was almost universally employed for wounds of the limbs after a preliminary *débridement*.

In the early cases the wound was lightly packed with vaselined ribbon gauze which had been previously prepared and sterilized on the spools and, where there was a wound of entry and exit, a piece of gauze was pulled through from one wound to the other, with the idea of encouraging drainage to the surface.

The whole limb was then encased in an unpadded plaster cast.

In the case of the lower limb, the cast included the whole of the foot as far as the web of the toes on the dorsum and beyond the toes on the plantar aspect. If the plaster is not extended to these limits the limb is certain to develop œdema where it is not supported by the cast.

It was found that these cases did quite well for a while and then began to develop a low-grade pyrexia. Upon removing the plaster, the gauze packing was found to be acting as a plug and the wound was full of pent up pus. The temperature subsided when the packing was removed and a fresh plaster applied.

I then asked myself what purpose was served by the vaseline gauze pack and, as I could find no satisfactory answer, I no longer put gauze or any other foreign body into the wound but contented myself merely by covering the surface of the wound with a layer of sterile vaseline gauze to protect it from the plaster cast.

The original purpose of packing the wound with gauze was apparently to keep it open so that the skin would not unite before the base of the cavity was healed. But, in those wounds with which I had to deal, there was usually so much loss of skin that this possibility could not arise and, furthermore, the natural elasticity of the skin tended to keep the wound open rather than allow it to close too soon.

I never used antiseptics of any kind in the wound. Prior to excising and exploring the wound I shaved the skin around and painted it with iodine but, apart from that, I was guided by the principle enunciated as long ago as 1887 by Gamgee, who said that "the question is not one of antiseptics or no antiseptics but of the form and proportions in which they should be employed in particular conditions. The great antiseptic is Life. The living tissues have a natural preservative power which, if guarded and conserved by the surgeon on physiological principles, offers the surest guarantee

for healthy repair which is only an adaptation and extension of normal nutrition."

Apart from one fatal case, the post-mortem findings in which are recorded later, all the wounds did uniformly well.

Two cases, one a splinter wound of the buttock and the other a traversing wound of the thigh, I did not at first put into plaster but contented myself with *débridement* only, merely covering the wounds with a sterile dressing and a soft bandage.

In a couple of days there was a spreading infection into the cellular tissues underneath the skin. A plaster cast was applied, and in both cases the immobility of the tissues so produced brought about an immediate cessation of the inflammatory process and the condition rapidly subsided.

This completely confirmed the views of Trueta (1939) of the paramount importance of immobility in preventing the spread of bacteria along the lymphatic channels.

Foreign bodies, if they were readily accessible, were removed but, if they were difficult of access, they were left.

During the rush periods, some cases which had a small foreign body retained and a wound which was reasonably clean and small were left over. These nearly always developed infection later and had subsequently to be opened up and the foreign body removed.

I found that wounds that were thoroughly opened up and thus permitted free drainage, *provided they were adequately immobilized*, almost invariably progressed smoothly and healed with much greater rapidity than one is accustomed to expect, taking as the usual standard the rate of healing in non-immobilized tissues.

Not only did the wound heal more rapidly but the infection very quickly became localized, all signs of inflammation in the surrounding area subsided, and the cedema, redness and pain disappeared.

There was a profuse discharge of pus in all cases, the amount appearing to depend on the degree of infection which was present at the time of the *débridement* of the wound.

I always excised as freely as possible all necrotic and injured tissue but I did not spend an excessively prolonged time in attempting to remove every particle of infected material which in practice appears to be an unattainable ideal. I relied however upon free and adequate drainage.

If the temperature did not subside within three or four days or if, having subsided, it rose again, the plaster cast was removed and the source of the temperature elevation investigated.

It was usual to find that there was a pocket of pus present, where the infection had tracked up into one of the cellular spaces at the periphery of the wound, and this was dealt with by incising the overlying skin so that the pocket was laid open and thus provided with adequate facilities for free drainage. The plaster cast was then re-applied.

Occasionally the patient complained of burning pain under the plaster.

This was due to excoriation of the skin where there was a free flow of pus over it. It could in a large measure be prevented by smearing the skin with vaseline all around the wound before putting on the plaster.

In spite of adequate *débridement* the application of a closed plaster cast might occasionally fail to produce the usual fall of temperature and it was then necessary to review the case and consider the possible cause of the persistent pyrexia.

Patients who have been evacuated from tropical Africa frequently suffer from metazoal infections and these had to be excluded. But in my experience the most likely cause of the persistent pyrexia was wound infection. As a matter of practical politics it is sound policy to investigate this possibility first. Actually, I was never able to demonstrate malarial parasites in the blood of patients who had been wounded in Eritrea and who were admitted as battle casualties.

In our series of cases of gunshot wounds of the limbs there was one death. This man illustrated in a striking way the clinical features of such a case which proceeds to a fatal termination.

He was a German prisoner of war and had been hit in both legs by machine gun bullets which had tunnelled the shaft of the tibia on one side and scored the surface of the bone on the other.

The wounds of entry and exit were small and appeared comparatively clean. The skin edges were excised, a gauze wick introduced into the wounds for the purpose of drainage, and both limbs were encased in plaster.

He was febrile on admission and his temperature did not subside. Because of this, a week later, one of the plaster casts was removed and the wound inspected. The swelling of the limb had subsided and the wound looked reasonably clean. There was not a great discharge of pus. The plaster was re-applied.

He was given M & B 693 with no fall in his temperature; sulphanilamide was equally unsuccessful.

He subsequently developed septicæmia with the following clinical signs: persistent swinging temperature, variable pulse-rate within wide limits, a progressive anæmia, marked wasting, diarrhœa, an enlarged spleen and enlarged liver and signs of congestion at the base of the right lung.

In view of the comparatively trivial nature of his wounds, the profound systemic disturbance which he showed was considered as possibly due to a concomitant metazoal or other infection, and the following conditions were considered: malaria, amœbic dysentery with hepatitis, typhoid and finally septicæmia.

All the laboratory tests were negative. The enlarged liver with signs at the right base was suggestive of hepatitis but actually the chest signs were due to a septic infarct.

At post-mortem examination, the bullet wounds in the legs were seen to be in an unhealthy condition with no evidence of reaction. There was a localized osteitis around the track of the bullets. Unfortunately it was not possible to obtain a culture of the organisms present in the wounds.

One learnt the following lessons from this case :

(1) In traversing wounds of the limbs it may be necessary to open up the whole of the track in order to provide adequate drainage.

(2) If the temperature does not fall to normal within three or four days after the application of the plaster the latter must be removed and the condition of the wound investigated.

Normally, following *débridement* and the application of a plaster cast, the temperature rises to 102° or 103° Fahrenheit, but it quickly settles and should show no further rise.

It sometimes happens that a patient does not respond so well or so quickly as one would like. In this event, a *blood-count* is of paramount interest and significance.

Facilities for the identification of the infecting organism may not be readily available but an examination of the blood can usually be carried out without much difficulty.

A severely wounded man may not be bleeding when he arrives at the base hospital but one must not forget that he must, of necessity, have lost a considerable quantity of blood when he received his wound. The continued loss of serum from a large surface, as well as prolonged suppuration, even in the absence of hæmolytic organisms, invariably leads to a progressive anæmia, and it is most important to be on the watch for the suspicious pallor which these patients show.

A blood-count will throw a flood of light on the situation and will indicate the appropriate line of treatment.

We had one case, with a very extensive splinter wound of the buttock, which well illustrated these points.

The wound had been excised and encased in a plaster spica at the C.C.S. Owing to the extensive loss of skin over the buttock, a wide area of tissue was laid bare, and a seepage of blood-stained serum continued for several days. This ceased, and was replaced by a fairly profuse discharge of pus.

The temperature was 100° F. on admission, and continued to oscillate between 99° and 100° F. for many days. The plaster was twice removed in an effort to find some pocket of pus that would account for the persistence of the temperature. But the wound was rapidly filling in with granulation tissue and the surface, within a fortnight, was almost flush with the surrounding skin. The granulations were healthy and there was no sign of serious infection.

A blood-count, however, revealed that the hæmoglobin was only 40 per cent of normal, and a white cell count showed a high polymorphonuclear leucocytosis.

These facts gave the clue to the appropriate line of attack ; a drip blood transfusion of 1,000 c.c., augmented by sulphapyridine by mouth brought the colour to his cheeks and the temperature to normal.

There may be an important place in the treatment of these cases for transfusion with dried plasma or serum but I had no opportunity of trying them.

In the early phases of the campaign we gave sulphonamide more or less as a routine to all infected cases but I subsequently found that adequate surgical treatment of the wound, with complete immobilization, was sufficient in the great majority of cases and I came to reserve sulphanilamide and sulphapyridine for resistant cases such as the one which I have just described.

III.—FRACTURES.

We dealt with thirty-six compound fractures made up as follows :

Femur	3
Tibia and Fibula	7
Tarsus and Metatarsus	5
Humerus	8
Radius and Ulna	7
Carpus and Metacarpus	6

Every compound fracture that arrived at this hospital was infected although in the majority of cases the degree of infection was not serious. In the early stages of the fighting the patients were admitted febrile and, frequently, in considerable pain from incomplete immobilization of the fractured bone ; but later cases were dealt with at the forward units and the limb encased in plaster casts. These patients were strikingly free from discomfort.

I formed the opinion that the views I have already expressed with regard to packing the wound with gauze, or leaving it open and merely applying a layer of vaseline gauze over the surface of the wound to protect it from the plaster, apply even more strongly to compound fractures than to wounds involving the soft tissues only. I could see no justification for putting into the wound foreign material which served more to prevent than encourage drainage.

It is necessary to protect the wound from the plaster cast, however, not so much for the sake of sterility but because, unless the vigorous young granulation tissue is held back by an impermeable dressing, it tends to grow into the interstices of the plaster bandages and is very painful when the plaster is removed.

Where *débridement* was necessary prior to the application of the plaster there was always a sharp rise of temperature to 102° or 103° F. but it fell to normal in three or four days.

Fractures of the shaft of the humerus were immobilized in a plaster abduction frame with the whole limb, including the shoulder-joint, included in the case. It was found that the U-shaped plaster slab that one uses for simple fractures of the shaft of the humerus was insufficient to provide adequate immobilization for these comminuted infected fractures with which we had to deal. Abduction of the arm was maintained by means of a Cramer wire splint, suitably bent, and incorporated in the plaster.

The degree of abduction, forward flexion and external rotation of the arm necessary for anatomical reduction of the fracture varied with the level.

Watson Jones (1940) says that generally the best position is one of forty degrees abduction and thirty degrees forward flexion.

With the patient anæsthetized and lying on his back it was somewhat difficult to be sure that the limb was held in the correct position while the plaster was hardening and it was found that the procedure was rendered considerably easier if the plaster was put on in such a way that each joint was immobilized in turn, starting at the shoulder.

A simple and satisfactory rule for obtaining the position recommended by Watson Jones is to hold the arm in such a position that the thumb of the injured limb is in a vertical line with the patient's nose, with the elbow at a right angle.

These comminuted fractures of the shaft of the humerus may take a very long time to unite and it is important to refrain from removing the plaster before X-ray evidence shows that there is firm consolidation of the callus. In any event, the union must be tested clinically when the plaster is removed and, if there is any doubt about the result, the plaster must be re-applied for a further period. Failing this, the callus already laid down will be absorbed and permanent non-union may result.

Two of our cases of fractured humerus were complicated by injury to the musculo-spiral nerve. In these cases the plaster on the forearm was extended into the palm so as to cock up the wrist.

When this requires to be done the plaster in the palm must extend sufficiently far forward to fix the metacarpo-phalangeal joints so that extension of the fingers can be carried out by means of the lumbrical and dorsal interossei muscles. If this is not done, extension of the fingers is impossible.

Fractures of the shafts of both bones of the forearm, especially in the upper third, are exposed to the risk of cross union.

Such a case was sent to us with the arm already in plaster. The patient had a very severe lacerated wound of the upper third of the forearm with an associated fracture of both the radius and ulna. The limb had been put up in the position mid-way between pronation and supination with the elbow flexed to a right angle.

We were able to X-ray the patient about three weeks after the original wound. By that time cross union had occurred.

Wounds of the forearm, with fracture of both bones in the upper third, should be put up in the fully supinated position to overcome the pronation of the lower radial fragment and further precaution against cross union should be taken by making the plaster cast oval in section instead of circular or by inserting wooden pegs between the two bones—over a layer of plaster.

Whenever plaster was applied to the hand great care was taken to see that the plaster did not extend beyond the proximal crease in the palm; that the plaster bandage extending over the web between the thumb and index finger was not too bulky and that the plaster was well cut away from the dorsal aspect of the first metacarpal so that all the fingers except the

one injured had free movement. It was found that fingers that were not thus adequately cared for very rapidly became stiff. For the same reason, any finger that had to be immobilized was always put up in the flexed position so that the movement of the other fingers was not interfered with.

Compound fracture of the femur accounted for three of our cases. One was per-trochanteric and the remaining two through the shaft. They were dealt with on the Böhler traction apparatus.

A steel pin was first thrust through the tibial tuberosity, and traction was then made on the limb until the measurements from the anterior superior iliac spine to the internal malleolus were equal on both sides.

X-ray apparatus was not available so we had to rely for the first attempt at reduction on clinical judgment. In practice, this is not so serious a handicap as might be supposed since, when strong traction is made on the limb in the Böhler apparatus, any gross deformity of the femur is automatically reduced and any tendency to backward bowing of the shaft of the bone can be corrected while the plaster is still soft by suspending the cast by means of a broad bandage from the vertical frame which forms part of the apparatus.

With the limb extended on the frame the wound was dealt with, any completely loose fragments of bone being lifted out. The wound was then covered with a layer of vaseline gauze and plaster applied to the whole limb from the pelvis to the toes incorporating the pin in the tibia. In one of the cases it was deemed advisable to include the sound thigh in the plaster spica but, in the remaining two, only one hip was immobilized, the sound limb being left free.

Following this treatment the patient was taken off the frame when the plaster was dry and, as soon as he was fit—in a few days time—sent for X-ray for confirmation of the position of the fracture. X-ray examination was now of course a simple matter since the patient was completely mobile.

The per-trochanteric fracture was anatomically reduced and required no further manipulation. The wound in the second case was so extensive that it had been possible to impact the ends of the two fragments manually. In the third case, a badly comminuted fracture of the lower third of the shaft of the femur, there was some backward angulation. This was readily corrected by sawing through half the circumference of the plaster on the dorsal aspect opposite the angulation, correcting the angulation, and then filling in the wedge so formed with fresh plaster.

IV.—WOUNDS OF BLOOD-VESSELS.

Two cases presented injury to an important blood-vessel as the outstanding lesion.

In one the anterior tibial artery was shot through immediately in front of the ankle. This was the only case which required urgent treatment on admission to hospital. There was a recurrence of the primary hæmorrhage

just after he arrived and the vessel required to be ligated. He made an uninterrupted recovery.

In the second case a bullet had traversed the lower third of the arm, from the lateral to the medial side, grazing the chest wall as it escaped. The brachial artery was severed as the missile traversed the arm and the median nerve was bruised at the same time but no other important structures were damaged.

On admission three days later, the patient presented a pulsatile swelling in the lower third of the arm and an absent radial pulse. The circulation in the periphery of the limb was satisfactory and there was no loss of movement or anæsthesia of the hand or fingers.

In view of the apparently quiescent state of the wound, it was treated conservatively for three days. By that time, however, œdema began to appear higher up the arm, and the limb was painful.

Through a longitudinal incision the deep fascia was incised and blood-clot turned out of the lacerated brachialis muscle. The two cut ends of the brachial artery were found without much difficulty and ligated and the wound was closed with a small drain under the skin. Apart from a mild infection along the suture line the patient made an uninterrupted recovery. Slight tingling over the skin area of the fingers supplied by the median nerve still persisted when he was evacuated.

The treatment of this case followed the lines recommended by Sir G. H. Makins but actually nothing was gained by delaying the exposure and ligation of the torn vessel and it seems likely that the infection which developed might have been diminished if the hæmatoma had been cleared out earlier.

V.—WOUNDS OF PERIPHERAL NERVES.

Four cases presented nerve lesions as an important feature of the injury. Two cases of fractured humerus were complicated by a lesion of the musculospiral nerve and one case of fracture of the radius showed the features of a lesion of the posterior interosseous nerve.

Since all these cases were several days old when they reached us, and were already infected, no attempt was made at suture of the nerve. The only special provision was the inclusion of a cock-up in the plaster cast.

It might have been wiser to have exposed the damaged nerve and perhaps tethered the ends together, if they were divided, but as these cases were subsequently evacuated I lost sight of them and I cannot say what the condition of the nerve will be when the wound is healed, the fracture united and the plaster removed.

One patient had been shot through the popliteal fossa from the lateral to the medial side. The wounds were small and clean—of the “leech bite” type—but when he arrived at this hospital, three days after the injury, he was already in considerable pain.

The wound itself did not trouble him but the painful area corresponded

to the distribution of the long saphenous nerve and later spread to that of the internal popliteal.

An injection of novocain into the long saphenous nerve as it lay over the medial aspect of the knee-joint produced immediate relief which, however, was only temporary.

The skin over the inner side of the leg and foot became hyperæsthetic and developed a punctate erythematous rash. He could not bear the bed-clothes to touch his leg and his condition became pitiable.

The popliteal fossa was exposed through a midline longitudinal incision, and the internal popliteal and long saphenous nerves were found to be involved in dense scar tissue which had formed along the track of the bullet.

The nerves were freed, and the patient's symptoms gradually began to disappear. A week after the operation he was considerably relieved but whether the relief continued I cannot say because he was evacuated at that time.

VI.—INJURIES OF THE SKULL.

We dealt with six serious injuries of the skull with one death. The points of interest which were brought out were :

(1) A deceptively small and innocent-looking external wound may be associated with a fracture of the cranium and the retention of a missile within the cranial cavity. For this reason it is essential to X-ray every injury of the skull. Failing the means of radiography, every skull wound ought to be explored.

One case arrived from the C.C.S. with a small wound on the forehead which had been excised and sutured. The day following admission, the patient developed meningeal symptoms.

Exploration of the wound revealed a fractured skull with a lacerated dura. He recovered following drainage and massive doses of sulphonamide and subsequent X-ray examination revealed the presence of a minute fragment of metal deeply situated within the cranial cavity.

(2) Primary suture of wounds of the scalp under field conditions, like primary suture of wounds in other soft tissues, is a dangerous procedure and is very likely to be followed by spreading infection which is rendered all the more precarious if there is an associated but unrecognized fracture of the skull.

Two cases arrived which had been primarily sutured. They were both infected and had œdema of the upper part of the face. Removal of the sutures and free drainage was followed by improvement.

(3) Very considerable damage may have been inflicted on the contents of the skull with no visible signs of external injury.

One patient—the fatal case—was admitted with multiple wounds, including a superficial searing wound of the cheek.

His condition appeared to be reasonably satisfactory for about a week when he developed signs of an intra-cranial lesion.

He died quite suddenly and post-mortem examination revealed a massive sub-dural hæmorrhage. He had been wounded by a nearby shell burst but he could not remember the details of the incident and no exact information was forthcoming.

(4) The intense headache which may be a late result of blows to the head may be greatly relieved, and the condition of the patient much improved, by the administration of a saturated solution of magnesium sulphate in water *per rectum*. It is best given very slowly by means of a drip apparatus.

One of our cases had been struck on the head by a splinter of shell. He was fortunately wearing his steel helmet at the time and this was smashed but it saved his skull from serious damage, the only injury that he sustained externally being a superficial wound over the mastoid process.

About a week after the injury he began to complain of very severe headache.

X-ray examination failed to disclose the presence of a fractured skull but there was blood in the cerebrospinal fluid.

He was nursed with his head elevated and magnesium sulphate solution was given in a rectal drip. His headache rapidly disappeared and the whole syndrome subsided.

VII.—PENETRATING WOUNDS OF THE CHEST.

We dealt with seven penetrating wounds of the chest with one death. Our series of cases fell into three groups :

(1) Traversing wounds with a small point of entry and exit, and no demonstrable hæmothorax.

(2) Traversing wounds with a closed hæmothorax.

(3) Penetrating wounds with an open pneumo-hæmothorax.

Cases in the first group presented the clinical picture of pneumonia, with the characteristic rusty sputum, etc., and they did very well under purely medical treatment with M & B 693.

Those in the second group, which included one fatal case, were less satisfactory. They were treated by repeated aspiration of blood from the pleural cavity and replacement with air. In three cases, the hæmothorax became infected and had to be drained by rib resection. These recovered but only after a fairly stormy convalescence.

The third group presented the same complications as the second with the added difficulty and danger of the sucking wound which had to be closed.

The details of the fatal case are as follows :

According to the Field Card he was received at the C.C.S. on the day that he was wounded in a very distressed condition.

Twenty-six ounces of blood were aspirated from his chest, with relief of his dyspnoea.

On the following day, he was passed on to the next hospital, where a

further 350 c.c. of blood were aspirated, and this time replaced by 100 c.c. of air.

He arrived at this hospital seven days after he had been wounded. He was collapsed with a subnormal temperature and a rapid pulse. He had a massive hæmothorax on the left side with small closed wounds of entry and exit.

He was left undisturbed for three days, when his temperature began to rise, and it was considered advisable to aspirate some of the contents of his pleural cavity.

450 c.c. of blood were withdrawn and 500 c.c. of air were introduced in its place by means of an artificial pneumothorax apparatus.

The intrapleural pressure recorded before the aspiration was commenced was plus six centimetres of water, with no respiratory excursion. Following the aspiration of blood and its replacement with air the manometer showed an excursion of several centimetres but the mean intrapleural pressure was the same. His immediate condition improved and he was less distressed.

Six hours later, he became distressed again with a rapid pulse-rate, but he gradually improved and by the following morning he was considerably better. A few hours later, however, he collapsed and died.

Post-mortem examination revealed the following features :

The left pleural cavity was three-quarters full of blood. The lung was completely collapsed. The bullet had fractured a rib at its point of entry, tunnelled its way through the upper lobe of the lung from the periphery to close to the hilum, and fractured another rib at its point of exit.

The pleura, where the blood had been in contact with it, was covered with a fairly heavy deposit of dark red fibrinous material which had obviously been deposited from the blood. It was fairly adherent to the pleura. This deposit ceased abruptly along a horizontal line which corresponded to the fluid level in the chest and, above this level, the pleura was normal in appearance.

The heart and pericardium were displaced markedly to the right but otherwise showed no abnormality. The right pleural cavity and its contents appeared to be normal.

The conclusions which I drew from a study of these penetrating wounds of the chest were as follows :

(1) Cases without demonstrable hæmothorax, but showing clinical signs of pneumococcal pneumonia, should be treated medically. They respond very well to M & B 693. It may be that a low-grade pneumococcus is the invading organism.

(2) Cases with a closed hæmothorax present a problem which has not been completely solved. If these cases are left without aspiration two unpleasant sequelæ may develop : (a) they may become infected—in fact they are very prone to do so ; (b) the deposit which was seen post mortem

will tend to bind the lung down in its collapsed condition and interfere with its subsequent expansion.

On the other hand, if aspiration is carried out too early, there is a very serious risk of encouraging further hæmorrhage and this does not appear to be completely guarded against even when the blood withdrawn is replaced by an equal quantity of air.

(3) Closed suction drainage of an infected hæmothorax may be improvised by means of a Dakin funnel.

The opening at the top is fitted with a rubber stopper through which a hole has been bored and a short piece of glass tubing fitted. To the lower end of the funnel is attached a piece of rubber tubing and a screw clamp. The apparatus is fastened to the side of the bed.

If now the funnel is filled with water and the drainage tube from the chest attached to the connexion at the top of the funnel, when the screw clamp is opened so that the contents of the funnel escape drop by drop into a receiver, a negative pressure will be created which is communicated to the pleural space.

The rubber tubing from the lower end of the funnel should end below the surface of the water in the receiver as otherwise air tends to enter the funnel and the suction is diminished.

(4) Following rib resection and closed drainage, a time comes when the empyema cavity is localized and a short drainage tube may be introduced into the chest and the discharge allowed to escape into the dressing on the chest wall.

These cases heal up much more rapidly if the patient is allowed up since by this means expansion of the lung is encouraged and the empyema cavity more quickly obliterated.

It is a universally accepted surgical teaching that every penetrating wound should be explored, hæmorrhage arrested and damaged tissue excised and there is no reason why chest wounds should be excluded from this basic principle.

Schrire (1940) reports a series of stab wounds of the chest in which immediate thoracotomy was carried out with universally satisfactory results.

I think that the answer to this problem of hæmothorax is that these cases should have been submitted to immediate thoracotomy.

The reason why we are faced with these unhappy dilemmas in dealing with chest wounds which are presented to us a week old is that, at that stage, we have to "make the best of a bad job."

VIII.—SUMMARY.

A brief description is given of the cases with which the Surgical Division of the 53rd General Hospital had to deal during ten weeks of the fighting in Eritrea.

The campaign was characterized by difficult country from which the wounded had to be evacuated and the considerable distances over which they had to be transported.

The striking absence of gas gangrene is noted. The closed plaster treatment of wounds was completely vindicated. The treatment of fractured femurs in plaster with a pin through the tibial tuberosity solved the problem of mobility of the wounded man and some views on the problem of penetrating wounds of the chest are expressed.

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THE TREATMENT OF ABDOMINAL WOUNDS.^{1 2}

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THE surgery of abdominal wounds has an importance beyond its operative implications. It is important in the morale of an army, for fighting men dread wounds of the abdomen and are fortified by their unexpected recovery. It is important as an index of the efficiency of the military-medical machine, for the survival rate depends on timing, placing, and equipment, on selection, pre-operative care and post-operative nursing, hardly at all on slick surgery.

In wounds of the limbs, we are concerned chiefly with forestalling infection by prophylactic surgical excision; in the abdomen, wound infection is less important, or at any rate overshadowed by the risk of damage to internal organs. Gas gangrene is above all a complication of shell wounds involving large muscle masses such as the thigh, the buttock and the shoulder; in the abdominal wall it is rare, and not usually dangerous.

Thus the surgery of abdominal wounds has a certain similarity to the surgery of abdominal trauma in peace time, the chief difference being that it cannot be reduced to rules. Any organ or combination of organs can be damaged in any way, and by wounds that are often not apparently abdominal at all. Injury to abdominal viscera is often combined with injury to the lung or to the hip-joint. The wound of entry may be in some distant part of the body, it may be inconspicuous, and it may be quite unknown to the patient.

Gordon Taylor relates the case of a soldier who was standing by his horse well behind the front line, when he was suddenly seized with severe pain in the epigastrium. He presented the complete clinical picture of a duodenal perforation, and at operation a perforation was found in the usual situation, the only unusual thing being the presence of blood in the peritoneal cavity. The hole was closed and the man improved, but the next day suddenly got worse and died. At the post-mortem a machine-gun bullet was found in the posterior duodenal wall, its point embedded in the pancreas. The entry wound was a tiny puncture in the right supraspinous fossa. The first point I would make, therefore, is that everybody who handles the wounded, and particularly the sorting officer at a C.C.S., must be on the look-out for abdominal injuries, even in cases that are not labelled as such.

In the days when the long rifle bullet was the chief missile of warfare, many men with abdominal wounds recovered spontaneously. A few did

¹A paper read before the Kenya Branch of the British Medical Association, May 6, 1941.

²Reprinted by permission from *The East African Medical Journal*, June 1941, 18, 67.

so in the last war and some, with tangential wounds involving solid organs only, may still be expected to survive. But in modern warfare we must regard every man who is wounded in the abdominal cavity as certain to die unless he is operated upon and as likely to die unless he is operated on early. On the other hand, if he survives, his prospects of enjoying a normal and useful life are better than those of the man with serious injury to the head, face or limbs. For both reasons, the urgency of operation, and the satisfactory prospects it offers if successful, cases of abdominal injury demand special consideration. In any unit the sorting officer must set them aside as cases demanding urgent attention and probable surgery and in certain conditions it may be wise to devote special teams or even special hospitals to their care. Operation within six hours of injury is necessary if any but a small proportion are to survive and the attainment of this ideal is largely a matter of administration, and of arranging to bring the patient to the surgeon or the surgeon to the patient within that period. In a warfare as highly mechanized as that of to-day this problem may be easier than it was in the last war, provided that the equipment is kept simple. Safety now lies in concealment rather than in distance, so that abdominal centres can often be sent right forward. But it is not merely a matter of pushing up mobile operating teams. A man with an abdominal wound may require careful investigation, he is likely to need some resuscitation before operation, he may want transfusion during it, and he is very unlikely to survive unless he can be carefully nursed for a week afterwards before he is transported. The arrangement and equipment of a unit must, therefore, bear this in mind.

The investigation of a case admitted as an abdominal injury must be brief and purposeful and there is no place for intricate pathology or for balancing the philosophies of higher diagnosis. The surgeon has to answer four questions :

- (1) Is this an abdominal injury ?
- (2) If so what structures are injured ?
- (3) Does that injury necessarily demand operation ?
- (4) If operation is advisable, can the patient stand it, now, or at all ?

Bearing in mind what has been said about penetrations of the abdomen by minute particles, and by projectiles entering the body at some distant point, it is essential to regard every case presenting abdominal symptoms as an abdominal wound till it has been proved to be otherwise. Four groups are likely to cause difficulty; thoracic wounds, spinal lesions, abdominal contusions and blast injuries.

Thoracic wounds are often accompanied by considerable abdominal pain and rigidity, the abdominal symptoms perhaps overshadowing those in the chest. The decision as to whether the wound is abdomino-thoracic or purely thoracic is important, for in the first case operation is urgently necessary, in the second it can be and sometimes should be postponed. The main points of distinction are that in purely thoracic wounds the rigidity is strictly unilateral, whereas in abdominal wounds it is total, or limited to

certain peritoneal compartments rather than to one side ; that the rigidity is variable, often lessening as the patient's attention is distracted, and tending to disappear rather than to increase ; that purely alimentary symptoms such as vomiting and distension are absent, and that the general condition of the patient tends to improve unless there is an open pneumothorax or progressive bleeding, when the distinction is less important, operation being necessary in any case. Spinal injuries may also mimic abdominal injuries, causing referred abdominal pain and sometimes rigidity also. When these symptoms are the only ones noted, and the patient is collapsed, the signs of cord involvement may escape notice. It is, however, important to test the sensation and movement of the legs when the track of the projectile passes near the spine, since an abdominal operation on a paralysed patient is useless, and a useless operation is a crime against the man whose turn comes next.

The possibility of infra-abdominal injury accompanying wounds or contusions that are apparently limited to the abdominal wall must always be borne in mind. Tears of the spleen and liver, rupture of the jejunum, ileum or duodenum may occur in men injured by explosions no less than in those involved in civil accidents. When the abdominal wall has been injured, shock, localized tenderness and localized guarding will always be found : but if the injury is purely parietal the shock will rapidly decrease with rest and warmth, and the tenderness and guarding will diminish or at most remain stationary. A rising pulse, the discovery of tenderness at some fresh site such as the bottom of Douglas' Pouch, and a tendency for the guarding to involve uninjured areas of the abdominal wall, these mean intra-abdominal mischief and demand laparotomy. Attention must also be drawn to "blast abdomen," a condition found in patients subjected to a sudden increase in the pressure of their surroundings, as when a shell or bomb explodes within 30 feet of them, or a mine or depth charge is detonated in the sea near where they are swimming. These patients present the picture of acute general peritonitis, such as that seen with a perforation. They are collapsed, in great pain and their abdominal wall has a board-like rigidity. Sometimes there is actual rupture of the gut, but more often laparotomy or post-mortem discloses multiple sub-peritoneal hæmorrhages all over the abdomen. The distinction can only be made by careful observation, the patient being given morphia and kept warm and still, and a half-hourly chart of the pulse being kept. Auscultation is an invaluable method of investigation in all these doubtful abdominal injuries and should never be omitted. A silent abdomen is an abdomen in need of laparotomy.

Where there is a wound, the need for operation is usually apparent and further investigation is a waste of time. In through and through wounds the direction of the track joining the two openings will give a very fair indication of the viscera that are probably damaged. In tangential wounds protrusion of omentum or bowel, or the escape of intestinal contents or of blood welling out with the movements of the diaphragm, will show the nature

of the injury and indicate the need for operation. In single wounds, however, an estimate of the direction of the track is difficult without knowledge of where the retained foreign body lies. Here an X-ray is invaluable, but rapid screening or a single film is usually all that is required and no exact localization should be attempted. The information is required to enable the track of the wound to be visualized rather than to help in a search for the foreign body, a search which would in any case be guided by points of attachment, vascular pedicles and peritoneal compartments, rather than by surface markings.

An estimate of the course of the projectile will guide two decisions, whether operation is necessary and what incisions should be used. In most cases operation is necessary and should be done as soon as possible, but where the liver or kidney appear to be the only organs involved and there is no severe bleeding, its scope should be limited to excision of the outer part of the track and the establishment of drainage. When it is known that visceral injury is limited to the neighbourhood of a wound in the parietes, it is usually best to approach the abdomen through that wound; if on the other hand the damage involves distant structures, a laparotomy incision is needed.

The best time for operation is the earliest at which the patient can stand it. All men with abdominal wounds are to some extent shocked, and the majority will be better for a short period devoted to resuscitation before being taken to the theatre. This period must be actively supervised and anxiously watched by a responsible officer, for while shock is being overcome vessels are also bleeding and torn viscera discharging their contents into the peritoneum. There is one "best" moment for operation in every abdominal wound and it must be seized, for it will never come again. The shock is compounded of many elements—mere physical exhaustion, pain, dehydration from sweating, plasma loss, and actual shortage of water intake during the fighting; loss of blood and toxæmia from early infection. The administration of morphine, the restoration of body heat by cradles, and the mechanical assistance of circulation by tilting the bed are essential.¹ Fluids may be given by the rectum if the large intestine is known to be undamaged, or intravenously to such cases as are not bleeding. If blood is still being lost, fluid should be withheld till the patient is actually on the table and the loss can be controlled, unless conditions and the supply of blood or plasma permit administration by the continuous drip method.

Two hours is usually the maximum period that can be allowed for resuscitation, and a much shorter one should be aimed at. If a patient is not then fit for operation, he never will be. Only too often the extent or nature of a man's abdominal injuries, or the presence of wounds elsewhere that are incompatible with life, stamp the case as hopeless from the start. It is

¹ The foot of the bed must not be raised if there is already evidence of free fluid in the peritoneum.

unfair to others to waste on the dying time that might save their lives. In other cases it may be necessary to abandon an operation when its futility has become obvious. Only in exceptional circumstances, and when there is no other call on the theatre and ward personnel, can a hopeless operation be justified on humanitarian grounds. On the other hand everything must be done for the comfort of these dying men and they should be kept apart from the less seriously wounded who are awaiting operation.

Little need be said of the circumstances of an operation on an abdominal wound. Of the theatre it need only be mentioned that its equipment must be of the simplest or it will not be transportable to the place where it ought to be, but a good light, a table that can give the Trendelenburg position if required, and some sort of a suction apparatus, are essential; of the anaesthetic, that spinal anaesthesia is anathema under conditions of war, and that gas and oxygen with local infiltration of the abdominal wall is probably the best, with warm ether a good second; of the surgeon that he must be able to make decisions, to work quickly, and to stand long hours.

The patient has wounds already, and these should be excised as part of the surgical toilet, but this excision is second in importance to the intra-abdominal procedures. If the injured viscera are not put right the patient will certainly die; if the wounds are not excised they may go septic, but with chemotherapy the sepsis may not be severe. If some of the wounds are on the back, or in places that cannot be reached from the position of exploration, they should be dealt with first, for every unnecessary movement should be avoided after laparotomy. In many cases the original wound can, after excision, be enlarged for approach to the abdominal cavity; to do so saves time, and saves damage to the abdominal wall, and, therefore, lessens the risk of post-operative pulmonary collapse and embolic vascular complications. If, therefore, the wound is so situated that it can be enlarged without damaging important structures and if the injured viscera are known to be in its neighbourhood, this course should be adopted. If the wound is not suitable for enlargement, or if the visceral damage is distant or widespread, a separate laparotomy incision should be employed. Thus where there is a wound in the flank penetrating the colon and kidney but nothing else, the whole operation may be done through the original wound; where there is a wound of the buttock penetrating the bladder and rectum, the entry wound should be excised down to the bony pelvis and packed with vaseline gauze, and the bladder and rectum should then be repaired through a **midline infra-umbilical incision**. A wound near the midline anteriorly may be excised and enlarged in the vertical direction, and one in the flank may be extended transversely inwards, or obliquely into the iliac fossa, but those in the intermediate areas cannot be enlarged sufficiently for any but local inspection without doing unnecessary damage. The standard incisions for exploring the abdomen are the right and left para-median, which may be high or low and extended as required, and the midline infra-umbilical incision which is better for approach to the pelvis and less traumatic than a

really low paramedian.¹ The upper abdominal median approach, the best of all incisions for planned gastric surgery in peace time, is liable to give way after suture when used in conditions of infection. Other incisions, such as transverse and the right and left subcostal incisions (Kocher) have, in my opinion at any rate, no place in the surgery of abdominal wounds.

Before examining the abdominal contents, it is wise to make a small nick in the peritoneum at the lower end of the incision, in order to note the nature of the free fluid in the abdomen, whether it is blood or intestinal contents, and its amount. If there is much, the head of the table should be raised about 15 degrees, and the nozzle of a sucker pushed down into the pelvis to draw off the excess. As soon as fluid ceases to flow freely, the abdomen is opened, and the affected part is rapidly overhauled. Hæmorrhage is the chief cause of death in abdominal wounds and should be dealt with first; peritonitis is a secondary and later danger. When the abdomen is full of blood, the most likely sources are the mesentery of the small intestine, and the solid organs, the liver, spleen, kidney and pancreas. These should be examined in order, and the hæmorrhage should be arrested completely, or, in the case of the liver and pancreas, as well as possible, before any attempt is made to repair the hollow organs. As soon as it is under control, transfusion should be started.²

After the arrest of hæmorrhage, the next step is the discovery and repair of all perforations in the alimentary tract through which leakage of contents may take place. In most wounds the area of possible damage is already known, and that part will be investigated first, but the search must not be abandoned nor any repair put in hand till all the organs that may have been injured have been examined, and all the injuries have been recorded and considered together. The small intestine is the part most frequently injured, and will, therefore, be examined first in a general laparotomy, the coils in the line of the track being first overhauled. When a perforation is found, it is marked by clipping a pair of forceps across the extreme edges, and the intestine is rapidly gone over up and down from this point. Each

¹In war surgery the old-fashioned paramedian incision, which cuts through all structures in the same plane half an inch lateral to the midline, is probably better than the rectus retracting incision that is favoured by most surgeons to-day. It saves some time, some dissection, and some ligatures, but more important, it avoids opening tissue spaces to infection and heals better. Theoretically it should paralyse the strip of rectus that lies medial to it, but no weakness is ever demonstrated afterwards. The low muscle retracting incision when used for the removal of a suppurative appendix is often followed by what can only be described as an abscess of the rectus sheath and complete breakdown of the wound, whereas a muscle splitting incision will heal well under the same circumstances. This important practical detail is part of American surgical tradition, but it does not appear to be appreciated by British surgeons.

²The use of fine silk or linen thread for ligatures has many advantages. These materials are cheap and easily sterilized, and enough for a large operation can be carried in a single reel. They bite firmly into the tissues and their knots cannot come untied, so that a job of hæmostasis, once done, can be forgotten. Catgut ligatures on the other hand are very prone to slip and catgut knots to come adrift when the part is subsequently handled, leading to loss of blood that the patient can ill-spare, and to subperitoneal or mesenteric hæmatomas that obscure the outline of parts to be repaired.

lesion as it is discovered is marked with forceps, and each coil is returned to the abdomen, with forceps attached, as soon as it has been examined. It must be remembered that what goes in goes out, in other words that one large slit may represent the track through the bowel at that point but one small hole must always be paired with another. The holes may be very small, they cannot be recognized by touch, and if they are on the mesenteric border they cannot easily be seen, but they must all be found or an otherwise successful operation may be brought to failure by one tiny omission. After the small intestine, the stomach, colon and solid viscera should be examined by touch and vision, the abdominal wall being lifted up on a broad retractor and a portable light brought into play if necessary. Any retroperitoneal hæmatoma requires careful investigation, for it is often the sign of damage to the kidney or of the much more serious posterior perforation of the fixed portion of the colon.

When all lesions have been tabulated, and this takes much less time to do than to discuss, they must be repaired, a step that can only be considered regionally, since the method to be adopted varies from organ to organ. The repair finished the abdominal cavity is quickly mopped clean, and rinsed with warm flavine solution if there has been much soiling. Sulphathiazole powder dusted over the surface provides an additional safeguard. Any retained foreign body will almost certainly have been encountered and removed during the investigation of the track, but no time should be wasted in looking for it. If it has not been found, the usual reasons are that it is small, in which case it is unlikely to do any harm, or that it is lying outside the abdomen, usually in some large muscle mass, in which situation it will either remain encapsuled or betray its presence at a later date by exciting a localized abscess.

Finally the abdomen is closed with or without drainage. Both Gordon Taylor and Jolly dislike drainage but my own advice, admittedly based on a smaller experience, would be to drain when in doubt. So many of the hæmostases are not 100 per cent secure, so many of the sutures are done to a time limit rather than to a standard, so many of the tissues concerned in hæmostasis and repair have not the vitality of healthy ones, that I feel this extra precaution is wise. A fresh hæmorrhage is recognized at once if there is a drain, and a failed suture leaks to the surface instead of bursting into the peritoneum. I would, therefore, give my personal advice about drainage under three headings. Always drain the extra-peritoneal spaces and the outer layers of the original wounds, and drain the peritoneal cavity not for present soiling but for trouble expected at a stump or suture line in the next few days. Use vaseline gauze as drainage material and not rubber tubes. And having drained do not be in a hurry to undrain; there are two good times to remove a drain, twenty-four hours and ten days.

In discussing points of technique concerning the injuries of particular organs, the didactic method is used to save time rather than to imply that the advice has any higher authority than the opinion of the writer. Injuries

of the small intestine are much the commonest and, because this part of the gut is massed in such complicated coils, multiple perforations are the rule. They are usually small, the mucous membrane pouts through them and, because of this pouting and the immobility that follows injury, they often do not leak for many hours, and may even seal themselves. Perforations of the small intestine should always be closed by local suture if possible. It is unnecessary to trim the edges, and a single purse string or a single layer of interrupted invaginating sutures is usually sufficient. Resection of gut is required when conditions make simple suture mechanically unsatisfactory, as when a group of holes occurs so close together that their repair would overlap and deform the gut, when so many injuries are found in a given segment that resection of the whole would save valuable time, or when the injury is on the mesenteric border. Resection is also necessary where the viability of a portion of gut is destroyed, by crushing, by thrombosis of the vessels, or by detachment of the mesentery for an inch or more. End to end junction is best, and a single layer of interrupted sutures with occasional extra ones to reinforce invagination is quicker and safer than two continuous layers.

Wounds of the colon are less common, and less often multiple, for the colon runs a simple course except in its pelvic portion. On the other hand they are much more serious.

(1) Because they are often retro-peritoneal, and therefore easily overlooked.

(2) Because simple perforation is uncommon, and extensive damage, bruising, infarction of vessels, and rupture of the outer coats, is the rule.

(3) Because the contents escape earlier and in greater quantities than from a small intestine perforation.

(4) Because these contents are highly infective, and usually contain anaerobic gas forming organisms.

(5) Because retro-peritoneal cellulitis, often an anaerobic infection, is a common and very fatal complication.

Small perforations in the colon should be looked for with great care, whenever the direction of the track makes them at all likely. Those in the fixed portions of the colon, and on the mesenteric aspect of the transverse colon are particularly liable to escape detection, and a hæmatoma in the mesocolon or in the right or left paracolic gutters should always call for a minute investigation of the adjacent bowel wall.

Holes in the free portions of the colon may be closed by a purse string suture if the bowel wall round them is perfectly healthy, but in most cases a local repair is unsafe and resection is wise. A free mobilization is often required before the resected ends can be brought together without tension. Nearly all writers on military surgery advise end to end suture after resection, with or without cæcostomy, but this advice is unsound in the light of modern teaching and practice, and the high mortality in colon wounds in all pub-

lished statistics suggests that it is not good treatment.¹ After mobilization sufficient to allow the colon above and below the injury to be approximated without tension, the injured segment should be removed, and the cut ends above and below it, closed with crushing clamps, should be brought to the surface at one end of the incision or wound. The clamps are removed after twenty-four hours, and the continuity of the bowel is restored later by crushing the spur between the openings.

Wounds of the stomach are in themselves benign and, were it not that they are so often associated with injury to adjacent structures, would offer a good prognosis. The stomach itself is very viable, and its contents are usually sterile. Wounds of the body and fundus can be closed by a double layer of sutures. Those of the lesser curve require ligature of the vessels and dissection of the bruised lesser omentum before repair. Injuries near the pylorus may present greater difficulties, because their closure obstructs the narrow lumen at this point and a gastro-jejunostomy is required. Wounds of the duodenum, which must almost necessarily implicate the pancreas, common bile duct, portal vessels, vena cava or hilum of the kidney, are usually fatal.

The liver may suffer all sorts of injuries, from tunnelled holes to complete disintegration, with very few of which it is possible to deal surgically. If no other viscus is involved and bleeding is not severe, surgery is not called for. If a liver wound is bleeding, or if it is encountered as part of an abdominal wound, it should be cleansed as far as possible of blood-clot and liver fragments and pressure applied to the surface. For a wound of moderate size Jolly advises that a series of sutures of medium catgut should be passed through the liver wall well away from the wound edge with a blunt needle, and tied over the free edge of the omentum, which is laid in the gap. With larger wounds a gauze roll may be packed into the cavity and brought out at the surface, to be removed a week later. If the upper surface is implicated in a chest wound, it may be packed through the enlarged wound in the diaphragm, which itself is stitched to the skin.

The spleen, if involved in the track of a projectile, is usually split extensively. Bleeding may cease spontaneously or be controlled by suture, but

¹There has been a marked tendency in recent years to look on the large intestine with increasing respect or even fear. Its walls are thin, their blood-supply is poor, and the peritoneal coat is interrupted by a broad mesentery and distorted by fat blisters, the contents are highly infective and mechanically traumatic, its luminal pressure alters with explosive suddenness. No sutures can be placed accurately in its wall, and what are thought to be lemberts often pass through all coats and carry infection. All surgeons have experienced trouble with leakage and sepsis at the suture line after resection, and many feel to-day that no stitch should ever be put through a colon that is not both empty and sterile. A colostomy or a resected loop should not be stitched to the skin but the skin opening should be made to fit the colostomy; a segment of bowel should not be excised and the ends sutured unless the contents have been diverted above by an excluding colostomy for at least two weeks. Devine has shown the way to success in cancer of the colon by his operation of exclusion and Lahey has made resection of the rectum for cancer and of the colon for ulcerative colitis safe by stage operations in which the bowel is brought to the surface. In war-injuries the way to safety is the same, for cæcostomy provides only partial relief of tension at the injured site, and proximal colostomy is no better unless it is done some weeks before.

is very liable to restart. Splenectomy is, therefore, advisable in every case.

The stomach, the liver and the spleen are the organs most commonly involved in thoraco-abdominal wounds; next in frequency come the colonic flexures and the upper coils of jejunum. The chief problem presented by these wounds, which involve the lower thoracic and upper abdominal structures with the diaphragm between them, is that of approach, whether it shall be by thoracotomy or by a laparotomy incision. No rule can be laid down, and the decision will be governed by the site and direction of the wound track and by the extent and nature of the abdominal and thoracic injuries, the last consideration usually being the deciding one. If there is extensive damage to the chest wall, particularly if there is an open blowing laceration, the chest wound takes priority. Gross damage to the lung, progressive intrapleural bleeding, or a large diaphragmatic laceration, will all point to the need for thoracotomy. After the intrathoracic damage has been dealt with and the pleura mopped dry, the diaphragmatic wound is trimmed and enlarged if necessary in a radial direction. Through such an opening injuries of the stomach colon or upper jejunum can be repaired easily, and the spleen can be removed; on the right side a laceration of the dome of the liver can be plugged. The diaphragm must be repaired with a double row of sutures and the chest wall closed in an air-tight manner, the pleura being drained by a de Pezzer catheter inserted through an intercostal space. Should the abdomen require draining, this should be done through a separate stab below the diaphragm. If on the other hand the chest injury is one that does not in itself demand surgery, or if the abdominal injuries include structures below the hypochondrium, a paramedian incision should be used. The diaphragm can be repaired from below with surprising ease. A combined thoraco-abdominal approach is very severe, and is hardly ever necessary.

The kidney may be wounded alone, or as part of an abdominal injury that involves many structures. Compared with the other solid organs, the liver spleen and pancreas, it stands up to the impact of projectiles remarkably well. It has very little tendency to fragment, it does not bleed profusely or long unless the main vessels are injured, it has considerable resistance to infection, and remarkable powers of recovery from partial injury. Thus nephrectomy is rarely indicated. In injuries to the kidney alone, the leading symptoms are hæmaturia, which is always present unless the ureter is divided or the kidney lacerated extensively, and the presence of a retro-peritoneal swelling in the loin which if large may lead to meteorism. An injured kidney should be approached through the loin, but in most cases interference should be limited to draining the perinephric space with a cylinder of vaseline gauze. A tangential injury at one pole may be trimmed and approximated with a few stitches. Nephrectomy is required for division of the ureter, injury to the main vessels, or profuse hæmorrhage from the torn kidney, laceration incompatible with recovery of function, and later for

persistent or recurrent hæmorrhage. A kidney injured in a trans-abdominal wound will be approached through the laparotomy incision and removed, if need be, by that route. In most cases it can be treated conservatively, but the retroperitoneal tissues must be drained.

Wounds of the pelvis are particularly fatal, not only because they tend to involve the bladder and the rectum but because the projectile usually enters through the thigh or the buttock. Injuries to the hip-joint and femoral vessels are commonly associated, and gas gangrene is a constant danger where large muscle masses are exposed to faecal contamination. Both bladder and rectum may be wounded intraperitoneally, extraperitoneally, or in both portions. The openings in each must be discovered, trimmed and sutured, and the operation requires the Trendelenburg position, a good light, thorough anatomical knowledge and dogged persistence. The bladder wall must be freed well round the wound before the sutures are inserted, a step that is much more difficult in an empty organ than a distended one. When the injury involves the neighbourhood of the ureteric orifice, the ureter must be detached and implanted elsewhere in the bladder. The rectum can be reached from above in its upper four inches, but for injuries of the lower two it should be approached by an incision in the median raphé behind; to gain room it is better to extend this incision beside the coccyx than to remove the coccyx. After suture both the rectum and bladder should be drained, the rectum by colostomy, the bladder by a suprapubic tube. An indwelling catheter can give first class drainage when it is well looked after, but it is not fool-proof.

The above notes give a brief outline of the principles, rather than the practice, of the surgery of war wounds of the abdomen. There is something dramatic about the subject that has always brought it into the limelight. It is a pity that human suffering should ever be dramatized and that life-saving should ever become the battle ground of rival statistics. This is important surgery, and surgeons should seek no more than to be given the chance to do it under the best conditions, and to do it as well as they can. The surgeon with the lowest death-rate may get the credit, but the one with the lowest rejection rate is probably of most use to the Army.

A PORTABLE SHOWER AND DISINFESTOR UNIT.

BY CAPTAIN R. H. C. MANIFOLD,
Royal Army Medical Corps.

Purpose.—(a) Main: (1) hot showers; (2) disinfestor (Serbian barrel principle). (b) Subsidiary: (1) hot water for ablutions; (2) hot water for cookhouse purposes.

Advantages.—This unit has been designed to meet the requirements of the smaller type of unit where only a cold water supply is laid on; it can also be used where no water supply is laid on but streams or wells exist by means of buckets, stirrup-pumps, etc.

(a) *Very portable and compact.*—The whole unit, except for the wooden support, which folds up, packs into the one barrel.

(b) *Cheap to make and run.*—The total cost of the machine as built was 30s. This included everything, except the tar drum and the oil drum, which were obtained from salvage.

(c) *Extremely easy to work.*—The unit when built can be run up in twenty minutes and converted into the Serbian barrel in ten minutes.

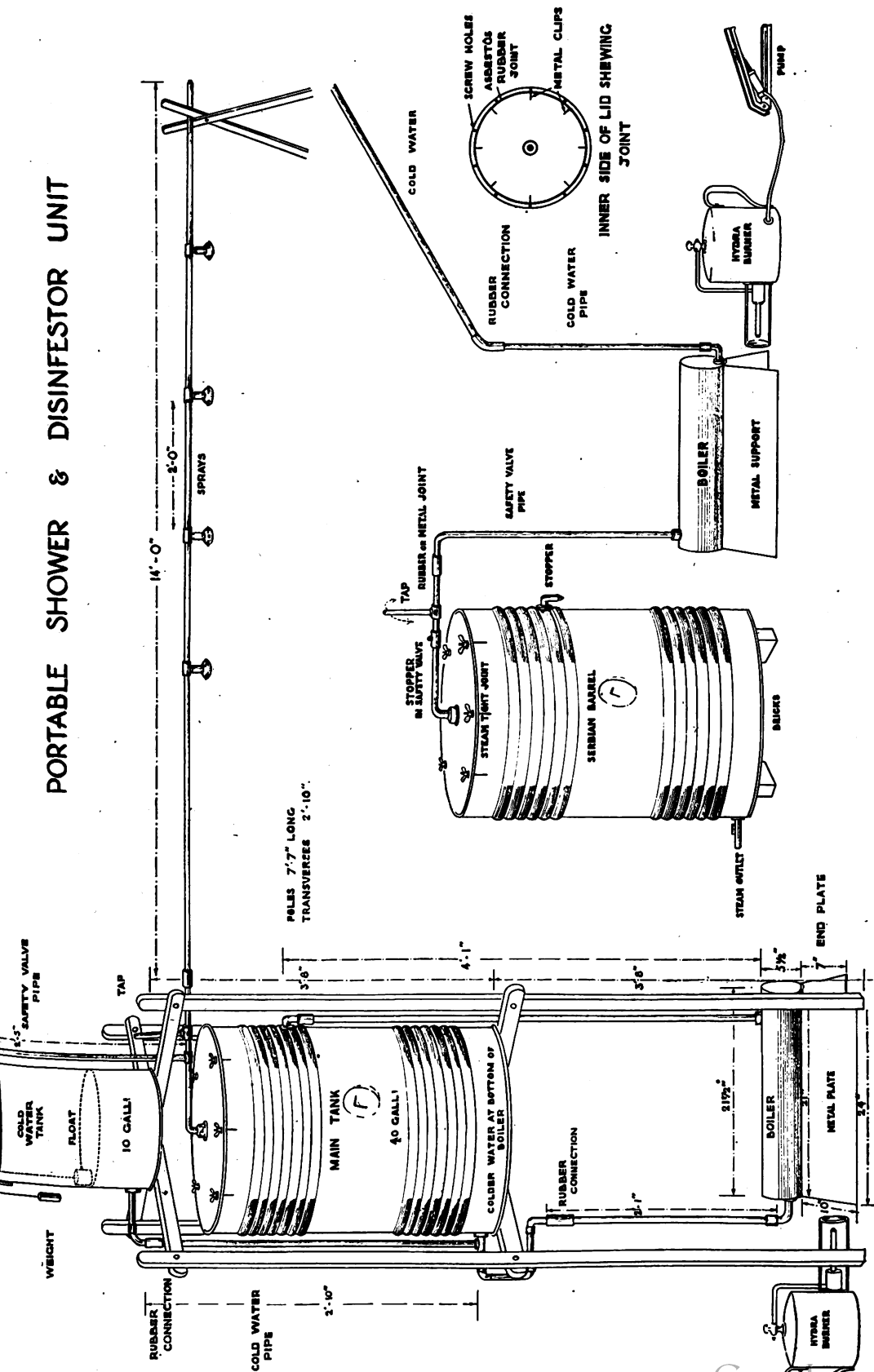
Component Parts.

- (1) One 40-gallon tar drum.
- (2) 8 to 10-gallon oil drum.
- (3) Piece of metal piping ($\frac{1}{8}$ to $\frac{1}{4}$ inch) 21 by 5 $\frac{1}{2}$ inches.
- (4) Water piping and joints $\frac{3}{4}$ inch, roughly 30 feet.
- (5) 3 feet rubber hose, 1 inch diameter.
- (6) Sheet iron plate, for lid of main drum, 1 foot 11 inches diameter.
- (7) Four watering-can roses with rubber connexions.
- (8) Asbestos rubber for water and steam-tight joints.
- (9) Roughly 50 feet of wood 3 by 2 inches for the supports.
- (10) One tap, the handle of which is used as spanner for tightening the bolts of the supports.
- (11) A length of hose-piping for leading cold water supply.
- (12) Pot of red lead for insuring watertight joints.
- (13) Bolts and screws.

Showers.—There are four showers at 2 feet intervals, the first being 4 feet from the tank. The handle at the beginning controls the supply of water. The far end of the shower pipe is supported by a bracket of wood 3 inches by 2 inches, making showers 6 feet 6 inches from the ground.

When the shower is erected it takes roughly fifty minutes for the main tank to be full of hot water. The Hydra Burner should be lit and put under

PORTABLE SHOWER & DISINFESTOR UNIT



the boiler and the cold water turned on—this insures a much more rapid filling of the tank with hot water than filling it with cold water before lighting the Hydra Burner. There is no danger of the tank exploding because the safety valve is under no pressure and communicates directly with the main tank. As the pipe is higher than the cold water tank it does not interfere with the hot water supply.

On testing the shower the following results were obtained: (a) 50 men could have five minutes' continuous hot water each in an hour; (b) 100 men could be bathed in an hour if eight men at a time were using the showers. Four men washing and cleansing and 4 men under the showers alternatively.

The cold water supply is kept continuously turned on to give the necessary pressure. The amount of cold water necessary to keep the showers at a hot, even temperature, is easily adjusted.

To Convert Unit to Serbian Barrel Disinfector.

Disconnect the shower unit; place the barrel on bricks; take the safety valve pipe and screw it into the hot water end of the boiler; leave the cold water pipe attached to the boiler, for the dual purpose of (a) acting as a safety valve to show when the boiler is nearly empty (when this occurs the steam, no longer under pressure from the remaining water, escapes) and (b) for refilling the boiler when empty.

Two pipe stoppers are used, one into the hot water pipe inlet and the other into the hole made by removing the safety valve pipe. Join safety valve pipe to hot water exit pipe by a metal jointing. Leave the shower control tap in sight. Leave main tank cold water connexion open to act as steam exit.

The barrel is now ready for use.

The top of the barrel is unscrewed and the clothes, etc., are put in, lid replaced and screwed down and the Hydra Burner lit.

On testing.—The time taken to disinfest 16 blankets was twenty-five minutes from the time of lighting the Hydra Burner.

For Cookhouses and Ablutions.

All that is needed is the boiler. The cold water feed pipe is left on, also the hot water pipe which is attached to the boiler. Hot water is produced in five to ten minutes. If a slow steady stream of cold water is added a constant flow of hot water is available. As soon as cold water is added to the boiler hot water comes out.

For heating purposes, where the Hydra Burner is not available, oil and water or an open fire will give the same results but they will be slower. In these cases the end plate of the boiler stand is removed, leaving the two side plates to act as a trench fire.

When packing.—The top of the main tank is unscrewed and into it is put the cold water tank which holds the boiler. The showers are taken down and the pipes unscrewed at the joints. These together with the remaining

dismantled parts are also placed in the main tank and the lid is then replaced. Therefore, when it is necessary to move, all that there is to be carried is one barrel and the collapsible wooden supports.

If the supports were also made of lengths of jointed piping they could be unscrewed and packed in the main tank as well, thus making the unit portable in one barrel. This was not done in this case as it would have added to the expense and the idea was to keep the cost of the unit as low as possible.



Editorial.

YELLOW FEVER IN THE SUDAN.

THE following facts are gleaned from an article entitled "An Epidemic of Yellow Fever in the Nuba Mountains, Anglo-Egyptian Sudan," by Dr. R. Kirk, appearing in the *Annals of Tropical Medicine and Parasitology*, October 21, 1941, 35, No. 1.

In 1934 it was definitely proved that the Nuba country of the Sudan was infected, or, at least, that 23 per cent of the sera collected there were able to protect mice against the yellow fever virus.

"In 1935 the histopathology of a liver section obtained by viscerotomy from a patient who died in Malakal after a febrile illness associated with jaundice was considered suggestive of yellow fever."

The patient had come from the Eliri district of the Nuba Mountains and, accordingly, sera from the area were sent to Dr. G. M. Findlay in London and a high proportion was found to be mouse protective from certain places though, we gather, not from all.

It appeared, therefore, that either yellow fever or some other illness capable of producing an immunity against yellow fever was or had recently been fairly wide-spread in that portion of the Sudan.

Inquiries proved that the district of Gulfan had been visited by a disease having the characteristics of yellow fever in 1934. This disease had been marked out by the presence of jaundice and had killed some twenty to forty of the people. It had, moreover, "produced considerable alarm among the population," a point to be noted in this connexion. Dr. Kirk lays stress on this. He says: "The present writer has observed two severe epidemics of cerebrospinal meningitis in the Nuba Mountains, in which the mortality rate was about 70 per cent, and in both instances the number of deaths was considerably higher than in this yellow fever epidemic; yet the amount of alarm caused by the cerebrospinal meningitis was negligible compared with that produced by the yellow fever epidemic."

In 1940, Dr. Ahmed Effendi el Araki, who had been at Gulfan in 1934, and was now stationed at Kauda, was impressed with the close resemblance of an outbreak of disease in the Tira and Otoro hills to the cases which he had seen in Gulfan in 1934 and he called the attention of the District Commissioner from Talodi, who was visiting the area, to this fact. The District Commissioner, on his return to Talodi, sent information on to Khartoum by telegraph and then fell sick with the disease himself!

The result was that Dr. Kirk, two British colleagues and a Sudanese laboratory assistant were sent to the scene of the epidemic forthwith.

The epidemic proved to be a very serious one leading, as far as could be ascertained, to 15,267 cases at least and to a total of 1,577 deaths. Immunity surveys carried out before and after the outbreak make it evident that about twice as many were infected as the number of recorded cases, though in most of the latter the disease was mild and clinically more like influenza than yellow fever. Arabs, Nubas and Europeans were about equally infected, race appearing to have but little effect on the mortality.

The nature of the epidemic was recognized by the following tests :

Pathological, by the finding of characteristic appearances in the livers of persons dying of the disease.

Immunological, by the demonstration that those suffering from the disease gave double mouse-protection tests.

Experimental, by the isolation of typical yellow fever virus from the blood of patients early in the disease.

Epidemiological, by the proof that the epidemic was followed by a rise in the proportion of immunes by mouse-protection tests.

The symptomatology is reviewed under certain headings ; headache, congested eyes, the appearance of the tongue, temperature and pulse (and a number of excellent charts of these are given), jaundice, nausea, vomiting and retching, the characters of the urine, hæmorrhages, hæmatemesis and melæna, the blood and the manner of dying.

The picture given of yellow fever is quite accurate and the disease is therefore demonstrated to produce epidemics in the Nuba Mountains and perhaps in other parts of the Sudan. A danger, in fact, must be regarded as existing until such time as it may be possible to inoculate the people against it. We fail to derive from this account, however, the same feeling of awe and fear as was once given by accounts of "Yellow Jack" in the West Indian Islands and other places exposed. Perhaps it was to our clouded imaginations that these accounts appealed, a similar "fear" to that described by Kirk as so common even in the Sudan ; or perhaps minor attacks were then unrecognized and therefore not appreciated as manifestations of the disease. At any rate the terror goes out of our mental picture when we find only a 10 per cent mortality instead of a death-rate in keeping with what we thought an almost invariably fatal disease. It is a pleasure to read this excellent account and to find that the disease is no longer what it was once thought to be.

Echoes from the Past.

REPRODUCTION OF AN ANCIENT COMMISSION.

DEAR SIR,—I think that perhaps the enclosed may be of some interest to your readers.

I am far from books of reference and must confess to an ignorance of what our Army was doing in Germany in 1760, and as to who are the signatories to the document. Can the "Granby" whose name appears among them be the celebrated Marquis whose name conjures up visions of foaming tankards under the trees of quiet country inns? Perhaps some of your readers can throw some light.

It will be noted that in those days the "Other Rank" was a "private person" and that the "Surgeon's Mate" was particularly warned against the reprehensible practice of selling his drugs and equipment for private gain!

I am greatly indebted to Lt.-Col. Rainsford, Provost Marshal of this Force, for presenting the document which I hope will find its way to our museum in due course, and to the East African Survey Company for their kindness in making the reproduction.

*Office of the Director
of Medical Services,
East Africa Force.*

August 1, 1941.

Yours faithfully,

R. E. BARNSLEY,
Colonel.

[The historical document reproduced on p. 317 is evidently an old Commission granted to Henry Remington as Surgeon's Mate to the Train of Artillery in Germany and bears date 1760. At that time the English were closely involved in the operations of H.M. King Frederic of Prussia—Frederic the Great—and were sending British units to assist him. Henry Remington, no doubt, was attached as Surgeon's Mate to the Train of Artillery sent to Germany with the latter. The Marquis of Granby was the "Second in Command" of the British troops in Germany at that time and probably signed the Commission in this capacity.—EDITOR.]

Clinical and other Notes.

ACUTE MENINGOCOCCAL CONJUNCTIVITIS.

By MAJOR F. CLIFTON,
Royal Army Medical Corps,

AND

MAJOR S. M. LAIRD,
Royal Army Medical Corps.

ACUTE purulent conjunctivitis and the demonstration of Gram-negative diplococci in the conjunctival smear naturally arouses the suspicion of gonococcal infection. This article seeks to focus attention on the less widely appreciated point that another member of the Neisserian group of organisms may closely simulate acute gonococcal conjunctivitis. The importance of establishing a correct bacteriological diagnosis in such cases is obvious at any time but is particularly necessary under present conditions, where the number of meningococcal carriers amongst large concentrations of troops may be relatively high. Much inconvenience and hardship may otherwise be unjustly inflicted upon innocent persons.

The introduction of serum therapy greatly reduced the incidence of acute conjunctivitis which previously complicated the terminal stages of cerebrospinal meningitis. Thus Randolph in 1893 quoted Hirsch and Ziemssen and Hess as finding it as an invariable concomitant, and McKee (1908 and 1909) isolated and positively identified meningococci from the conjunctivæ of three patients suffering from cerebrospinal meningitis. With serum therapy, however, no conjunctivitis occurred in a series of 66 cases reported by Lewis and in only one of a large number of cases reported by Tillett and Brown in 1935. Cushing reported that conjunctivitis was present in four out of 124 cases of cerebrospinal fever prior to commencing chemotherapy. Reese has recorded the case of a student nurse who, following contact with cerebrospinal fever, developed an acute unilateral conjunctivitis and mild signs of meningitis which responded satisfactorily to serum therapy. Cultures from the conjunctiva, nose, throat, blood and cerebrospinal fluid grew Type I meningococci and, although meningococci were found in the cerebrospinal fluid, no classical signs of meningitis developed.

The occurrence of acute meningococcal conjunctivitis without other clinical evidence of meningococcal infection is, however, of greater importance than the occurrence of conjunctivitis complicating meningitis as described above. Several examples of the former are on record; Koplik, in a report on 77 cases of cerebrospinal fever, described one case in which there was a definite history of conjunctivitis prior to the appearance of meningeal manifestations, and Smith reported a case of meningococcal

conjunctivitis occurring in a nurse who had been exposed to epidemic cerebrospinal fever. In this latter case, the organism was clearly identified by cultural study and the conjunctivitis responded to local treatment in a few days, without the development of meningitis. More recently, Hayden *et al.*, and Bennett have both recorded single cases of meningococcal conjunctivitis. In the former instance, one of the authors was infected by buccal spray whilst examining a hospital patient from whose sputum and post-nasal secretion the infecting organism was subsequently isolated and shown to belong to Type II. The conjunctivitis responded within a few days with purely local treatment. In the case described by Bennett, Type I meningococci were isolated from the conjunctiva alone and the eye condition was cured within seventy-two hours by local measures and chemotherapy with sulphapyridine. In both these patients it was noted that neither the degree nor the clinical course of the unilateral conjunctivitis was so severe as is commonly met with in cases of gonococcal conjunctivitis which was the provisional diagnosis made before complete bacteriological investigation had revealed that the Neisserian organism present was a meningococcus.

CASE REPORTS.

We have treated two cases of acute meningococcal conjunctivitis which were referred to hospital within a period of nine months. In both cases a diagnosis of gonococcal conjunctivitis had been made before admission, but the absence of any evidence of infection in the genito-urinary tract led us to suspect that we were dealing with meningococcal conjunctivitis. The first case unfortunately received sulphapyridine before cultural studies were made but, in the second case, full bacteriological investigation confirmed the diagnosis. Neither case, at any time, showed clinical evidence of involvement of the central nervous system.

Case 1.—The patient, aged 23, was admitted to hospital in the late evening of February 28, 1940, ten days after joining the Army. He had had bronchitis for five days and, on February 27, 1940, he noticed that his eyes were "blood-shot." On the morning of the day of admission he had photophobia, his eyes being painful, with swollen lids and a considerable amount of discharge. Exposure to venereal disease was convincingly denied. On examination the following morning, bilateral purulent conjunctivitis without severe chemosis or corneal ulceration was present. There was some catarrhal bronchitis and injection of the pharynx with mild pyrexia. Thorough investigation of the genito-urinary tract, including an examination of the prostatic fluid, revealed no abnormality. The conjunctival smear, taken on admission, contained numerous pus cells and Gram-negative diplococci. Local treatment and sulphapyridine had been instituted without delay on the night of admission and it was, therefore, not unexpected when conjunctival and post-nasal cultures, taken the following day, failed to grow any Neisserian organism. The patient was completely cured by March 6, 1940, the eyes being normal and the respiratory condition having completely abated.

Case 2.—The patient, aged 21, was admitted to hospital on December 7, 1940, with a history of discharge from the left eye for two days previously and coryza. The right eye was normal. There was a fairly profuse muco-purulent discharge from the left eye and slight œdema of the lids. The whole of the cornea showed

punctate staining points with three marginal ulcers between 11 and 1 o'clock. The smears showed a large number of pus cells and Gram-negative diplococci, the majority of which were extra-cellular. They resembled gonococci except in the absence of the characteristic concavity of the adjacent sides of pairs. Cultures and agglutination positively identified the organism as a Group I meningococcus. Treatment with M & B 693 was instituted the same day and a post-nasal swab, taken twenty hours after commencement of treatment, showed a practically pure growth of chromogenic *Neisseria*. Eight days after admission the cornea had healed and the conjunctivitis had practically resolved. Six days later, a horizontal line of minute staining points appeared on the cornea but, by December 26, 1940, there was complete clinical recovery. A post-nasal swab, from which no meningococci could be grown, was taken prior to discharge.

SUMMARY.

Two cases of acute purulent conjunctivitis caused by meningococci are described, in which other clinical evidence of meningococcal infection was absent. The condition may easily be confused with gonococcal ophthalmia unless this possibility is kept in mind and a full bacteriological study is carried out. In general, it would appear that the severity and clinical course of meningococcal conjunctivitis is less severe than that of gonococcal ophthalmia and that a rapid cure is achieved by orthodox local treatment with or without chemotherapy.

We are indebted to the Commanding Officer of a military hospital for permission to use the clinical notes of these cases.

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NOTES ON CASES OF CHRONIC DIARRHOEA AND VAGUE ILL-HEALTH, APPARENTLY DUE TO THE FLAGELLATE *GIARDIA LAMBLIA*.

BY MAJOR J. E. JAMESON,
Royal Army Medical Corps.

THE significance of *Giardia lamblia* in the stools has long been controversial. An account is given in these notes of the results in lambliasis of atebirin therapy which, due to its apparent "specificity" for *Giardia*, provides a new means of investigating the pathogenicity of this flagellate.

This line of investigation of cases of diarrhoea and ill-health in which *Giardia lamblia* is also present in the stools was suggested to the writer by the good results claimed in the treatment of *Giardia cholecystitis* with atabrin.

During the past month, 8 cases discovered to be passing this flagellate in the stools were given by mouth atabrin (or quinacrine) 0.1 gram t.d.s.p.c for seven days, after which a further examination of the stools was carried out. In every case the flagellate could not be demonstrated after treatment as will be seen from the Table which follows.

TABLE OF STOOL EXAMINATIONS.

Report on Stool before treatment.

Report on Stool after treatment.

No.	Date	Type of stool	Exudate	Microscopy	Culture	Date	Type of stool	Exudate	Microscopy
1	16.4.41	S.M.	OX	G.L.C.	N.D.	29.4.41	N.	OX	N.A.F.
2	14.4.41	L.M.	AX	E.H.V.	N.P.I.	—	—	—	—
	4.5.41	L.M.	IX	G.L.V.	N.P.I.	17.5.41	N.	OX	N.A.F.
3	5.5.41	L.B.M.	AX	E.H.V.	N.P.I.	23.5.41	N.	OX	N.A.F.
				G.L.V.					
4	30.4.41	L.	OX	G.L.C.	N.P.I.	22.5.41	N.	OX	N.A.F.
5	7.5.41	S.	OX	G.L.C.					
				C.M.V.	N.D.	19.5.41	N.	OX	C.M.V.
				B.H.					
6	9.5.41	S.	OX	G.L.C.	N.D.	16.5.41	N.	OX	N.A.F.
7	9.5.41	S.	OX	G.L.C.	N.D.	18.5.41	N.	OX	N.A.F.
8	7.5.41	L.	OX	G.L.C.	N.P.I.	22.5.41	L.*	OX	N.A.F.

INDEX OF ABBREVIATIONS USED IN TABLE.

S. Semi-solid stool	IX Indefinite exudate	C.M.V. <i>Chilomastic mesnili</i> vegetative forms present
L. Loose stool	OX Nil exudate	B.H. Blastocystis hominis
N. Normal stool	* After aperient	N.D. Not done
B. Blood present	G.L.V. <i>Giardia lamblia</i> vegetative forms present	N.P.I. Nil pathological isolated
M. Mucus present	G.L.C. <i>Giardia lamblia</i> cysts present	N.A.F. Nil abnormal found
AX Amœbic exudate	E.H.V. <i>Entamoeba histolytica</i>	

The above tabulation shows the laboratory aspect of these cases, which will now be considered from the point of view of the physician.

Case 1.—Serjeant X. During the year previous to admission he had been suffering from attacks of diarrhoea with a periodicity of about six weeks. He was admitted on March 10, 1941 to “?” General Hospital where the diagnosis of “dysentery, indefinite exudate” was made.

The patient did not respond to treatment in the usual way and rectal lavage was resorted to, but without success, mucus still being passed freely in the stools. On April 5, for military reasons, he was transferred to No. — British General Hospital where, though he had no diarrhoea, his daily stool contained much mucus and sometimes consisted entirely of it. The idea of invaliding him home as a “chronic mucus carrier” had for some time been considered, and a further laboratory test was then asked for. This showed the presence of cysts of *Giardia lamblia* (see Table). The patient responded quickly to atabrin and returned to normal duty before completion of the seven days’ course. He was discharged to duty, Category A.1 on May 3.

Case 2.—Corporal Y. For nine weeks before admission he had suffered from diarrhoea but had carried on. About April 7, 1941, he noticed blood and mucus

in his stools, reported sick and was admitted to — British General Hospital on April 14, where traces of blood and mucus were also seen in his stools.

On April 16, *Entamoeba histolytica* was found in the stools and the patient was accordingly given a course of 1 grain of emetine daily for twelve days. On completion of this course he was still passing five or six loose stools daily and a second stool examination on May 4 revealed the presence of numerous vegetative forms of *Giardia lamblia*.

A course of atebirin was started on May 7, and the stool chart was as follows :

7.5.41	..	3 loose stools
8.5.41	..	3 loose stools
9.5.41	..	3 loose stools
10.5.41	..	2 formed stools
11.5.41	..	2 formed stools
12.5.41	}	.. 1 formed stool
13.5.41		
14.5.41		
15.5.41		
16.5.41		

The patient was discharged to duty, Category A.1 on May 19.

Case 8.—Private Z. This patient had his first attack of diarrhoea five days after calling at Freetown on his way to the Middle East. The attack, which lasted a week, was accompanied by abdominal pains and about twelve stools were passed daily without evidence of blood or mucus. At intervals of three, three, four and six weeks he suffered similar attacks. The last of these had persisted for three weeks when a stool was sent for laboratory investigation (see Table).

The patient was given similar treatment to the others, and his diarrhoea ceased after three days. Two days later he had to be given salts to procure a stool for a second examination, a state of affairs which elicited the comment, "This is not at all like me."

This patient, who was unusually intelligent in giving his history, was most emphatic in his praise of the treatment and considered himself fully restored to health.

The five remaining cases, in which the benefit is not so clearly due to atebirin, are summarized as follows :

Case 3.—The patient had a mixed infection with *E. histolytica* and *Giardia lamblia*. He made an uneventful recovery on emetine followed by quinacrine. Owing to a misunderstanding no stool was sent for examination between the two courses.

Case 4.—A food handler, found to be passing cysts of *Giardia* in a routine stool examination, admitted on being questioned that he had recently had diarrhoea. He was treated and claimed benefit but was a bad witness.

Cases 5 and 6.—These were received for gastric investigation. Each case would have been discharged fit about twelve days after commencement of atebirin treatment but for the presence in one case of a gunshot wound in the arm and in the other of faulty teeth.

Case 7 was received as "N.Y.D. Malnutrition." He gave a history of diarrhoea before admission and his general poor state of health led to the suspicion of phthisis. He shows obvious signs of having "turned the corner" since treatment with atebirin.

The results to date of this investigation tend to incriminate *Giardia* as a cause of vague gastric disorders or of frank diarrhoea with periodic remissions. These latter cases do not produce blood and mucus or dysenteric exudation

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Note: Cards containing instructions for the patients can be supplied on request.

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in the stools unless the infection is superadded on a dysentery, an association which appears to occur frequently.

An interesting finding in Case 5 (*see Table*) was that a second flagellate present, thought to be *Chilomastix mesnili*, was unaffected by the treatment and its continued presence did not appear to inconvenience the patient.

Though it may justly be argued that the cases reported are too few for conclusive evidence it has been thought desirable to submit the results so far achieved in the hope that this treatment may be equally successful in other hospitals.

My thanks are due to Lieutenant-Colonel A. Harrison-Hall, R.A.M.C., Commanding — British General Hospital, for permission to submit this report, to Major C. M. Vaillant, R.A.M.C., Medical Specialist, for his advice and goodwill and to Captain E. J. P. McDowell, Captain N. H. H. Longton and Captain R. H. Hogg, R.A.M.C., for their willing co-operation in treating these patients, in the sending of specimens for laboratory investigation and for their notes on the cases.

A NOTE ON AIR-BORNE INFECTION IN HOSPITALS.

BY MAJOR N. H. MARTIN, B.M., M.A., M.R.C.P., F.I.C.

Royal Army Medical Corps.

THE apparatus described was devised and made in this laboratory to investigate air-borne infection in the passages and wards of the hospital. Shortly after we opened in 1940 the Officer Commanding Surgical Division

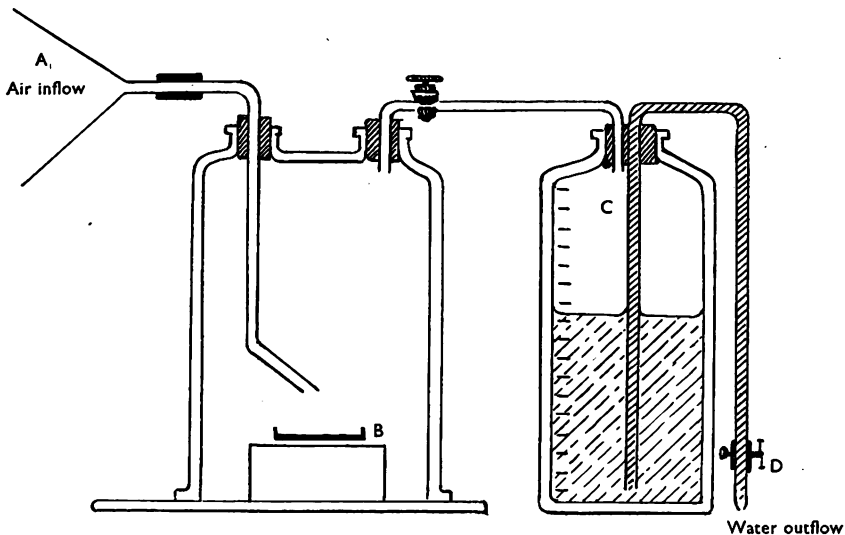


FIG. 1.—Diagram of the apparatus used for sampling.

asked for an investigation of the causes of post-operative chest and nasopharyngeal infection.

At the time there was a considerable amount of dust circulating from active structural alterations still in progress.

The apparatus (fig. 1) consists of a 6 inch funnel "A" connected with a Bulloch's Apparatus. The inflow tube is led over a Petri dish "B" as shown. The air replaced from the jar is drawn off into reservoir "C" the rate of flow being controlled by the jet on the syphon at "D." The volume of the sample is measured by the calibration of the reservoir "C."

The Petri dish is incubated in the Bulloch's jar in contact with the sample of air or it may be removed and incubated in the normal manner.

This simple apparatus can be assembled from the standard laboratory equipment on the I.1248. The volume of contaminated air to which the plate is exposed is measured as is the time of exposure. The rate of sampling

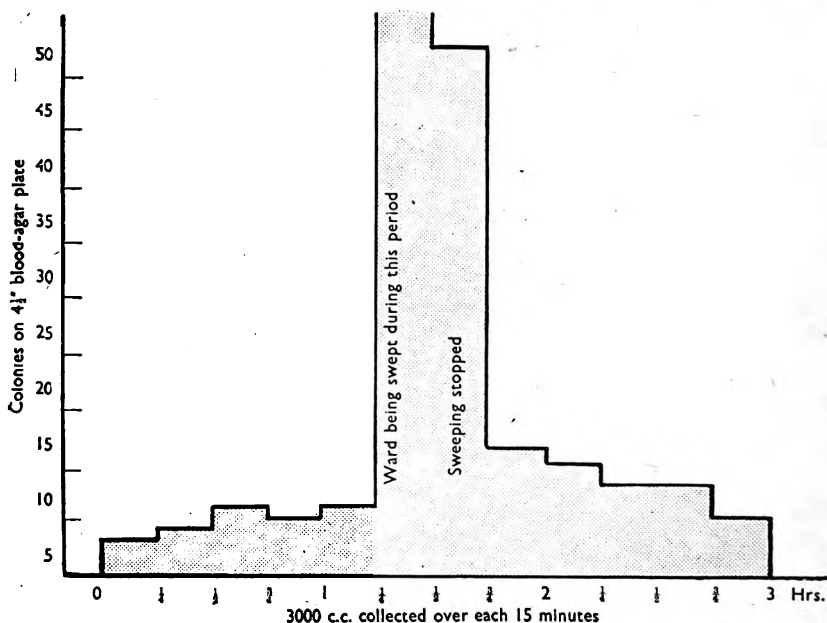


FIG. 2.—Composite graph showing the effect of sweeping.

can be varied by altering the jet "D." Samples can be taken in the form of "sweeps" along passages.

The accuracy of the results we obtained cannot be compared with the more elaborate investigations which Professor Miles and his team were carrying on at the same time. Nevertheless our findings did agree broadly with theirs. We were able to demonstrate the following points of practical importance.

(1) Certain routes from the surgical wards to the theatre gave consistently higher bacterial counts for standardized samples of air than others. These routes could be avoided.

THE PSYCHO-SOMATIC APPROACH

Modern medicine recognizes that mild depressions are frequently responsible for vague functional ailments which are none the less real because they have no demonstrable organic basis. The physical manifestations of such depressive states are amazingly varied. The first therapeutic objective may well be the elimination of the underlying psychoneurosis, and 'Benzedrine' Tablets, with their strikingly beneficial effect on mood, will often accomplish this aim by producing a marked increase in mental alertness, energy and ability to endure prolonged physical or mental strain.

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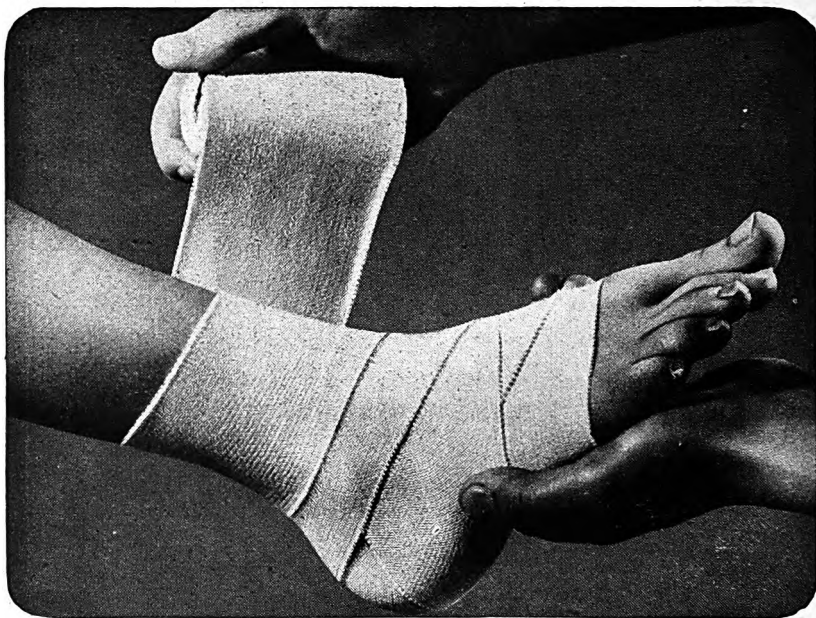


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(2) Counts were higher at certain times of the day than others. These times could be avoided for wheeling patients to the theatre.

(3) The bacterial content of the air in the wards rose steeply after sweeping. Diagram 2 shows a graph illustrating this. It illustrates the fact that the count did not return to normal until one hour after sweeping.

The counts we made were total counts, moreover it is obvious that each colony cannot be regarded as springing from one organism. The absolute figures are therefore of less value than the comparative figures. In spite of the many objections which we realize can be levelled at this piece of home-made apparatus it did give results of practical value.

Thanks are due to Colonel R. A. Anderson, M.B., F.R.F.P.S., for permission to forward this article for publication in the JOURNAL OF THE ROYAL ARMY MEDICAL CORPS.

REFERENCE

MILES, A. A. *et al.* (1940), *Brit. Med. Journ.*, December, p. 895.

Current Literature.

FRANCIS, T., Jr., and MOORE, ALICE E. **A Study of the Neurotropic Tendency in Strains of the Virus of Epidemic Influenza.** *J. Exper. Med.* 1940, Dec. 1, v. 72, No. 6, 717-28.

Stuart Harris [*Bull. of Hyg.*, 1939, v. 14, 575], showed that the W.S. strain of influenza virus could be made to produce an encephalitis in mice if it were subjected to serial passages through hens' eggs followed by serial passages through the brains of young mice.

In the present paper the authors confirm the ability of the W.S. strain to produce an encephalo-meningitis in mice when injected intracerebrally, but they found initial passages through eggs unnecessary: the virus "cultivated in the usual chick embryo culture medium" would produce the central nervous disease when injected intracerebrally without previous treatment. No evidence was obtained of the adaptation of the virus to a more highly neurotropic state. The comparative virulence of the strain administered intranasally or intracerebrally remained practically constant. The neurotropic effect of the virus seemed to be governed solely by the route of inoculation.

The Melbourne strain of influenza virus was also found to be neurotropic in the mouse; but five other strains (Henry, Talmey, Swine 1976, Alaska and Swine 15) were not.

The neurotropic characteristic seems to be inherent in the two strains rather than a new property acquired by adaptation.

Cross protection tests with the strain P.R.8, which is not neurotropic, indicated that the pneumotropic and neurotropic strains of W.S. were antigenically similar.

E. T. C. SPOONER.

Reprinted from "Bulletin of Hygiene," Vol. 16, No. 5.

Reviews.

WARWICK AND TUNSTALL'S FIRST-AID TO THE INJURED AND SICK. 18th Edition. Edited by Norman Hammer, M.R.C.S., Major, late R.A.M.C., T.A. Bristol: John Wright & Sons, Ltd. 1941. Pp. 320. Price 3s. 6d.

That a "First Aid" should have reached its 18th edition and 215th thousand needs no word of praise to indicate its popularity and usefulness.

It is stated in the Preface that many new illustrations have been introduced and certain old ones deleted. Part II dealing primarily with First Aid has been practically rewritten.

The expressed hope of the Editor of the book that the edition will be of interest and assistance to our splendid Civil Defence workers is, we feel sure, certain of fulfilment.

INDEX-CATALOGUE OF MEDICAL AND VETERINARY ZOOLOGY. Part 4. Authors: D. to Džunkovski. Issued in June, 1940. United States Department of Agriculture.

We have received a copy of Part 4 of this important Index-catalogue, which has been placed in the Library of the Royal Army Medical College.

The Index is on sale by the Superintendent of Documents, Washington, D.C. Price 30 cents.

A POCKET MEDICAL DICTIONARY. Fifth Edition. By Lois Oakes, S.R.N., D.N. (London and Leeds). Edinburgh: E. & S. Livingstone. 1941. Pp. xx + 418. Price 3s. 6d.

The issue of a fifth edition of this little dictionary so soon after the last edition is a proof of its popularity. Intended primarily for junior medical students it fulfils its function admirably. In addition to the comprehensive dictionary of medical terms, useful appendices on first-aid, gas warfare, urine testing and diets are given. We recommend this little book.

HOW THE BODY WORKS. Alternative edition with extra chapter. By L. S. Michaelis, M.D. Drawings by Kupfer-Sachs. London: Longmans, Green & Co., Ltd. First published 1940. Pp. xvi + 64, Figures 71. Price 2s.

This is a short easily read book which seeks to deal with Physiology in terms of everyday analogies. While bridges, ships, pumps and wireless are invoked to illustrate the functions of various organs the comparisons are not overdrawn and a reasonable sense of proportion is maintained throughout the book. The marginal drawings are good, illustrate the text

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and do much to keep the readers' interest. Technical terms that so commonly damp the ardour of the recruit who is anxious to learn are remarkable for their absence and, at the same time, the reader is not left in any doubt as to what an organ does and has a simple idea of how it does it. In this the book succeeds where many lecturers fail—"It adds artistic versimilitude to an otherwise bald and unconvincing narrative." The book should prove helpful to many who lecture from the R.A.M.C. Training Manual and should find a place in the Unit educational library—it will appeal and be helpful to many of the present type of intake.

R. W.

SURGERY OF THE HEART. By E. S. G. King, M.D., M.S., D.Sc.Melb., F.R.C.S.Eng., F.R.A.C.S., Major, R.A.M.C. London: Edward Arnold and Co. 1941. Pp. 709. Price 50s. net.

Surgery of the Heart is based upon the successful Jacksonian Prize Essay of the Royal College of Surgeons for the year 1938. The work is an exhaustive treatise, covering some 700 pages, in which the author has interpreted his subject in the widest possible sense. The book is divided into two sections, the one dealing with details of anatomy, physiology, pathology, radiology and electrocardiography and the second with surgical approach, experimental investigations, diseases of the myocardium, coronary vessels, endo- and pericardium and the great vessels.

The bibliography is immense, every known view is propounded with a clear and exact style. The work is indeed a monument of industry of which the author may justifiably be proud and for which those of the medical profession interested in the subject should be grateful.

Yet admiration for industry such as this is touched a little by a sense of disappointment for the level exact style seems strangely out of keeping with a subject of such absorbing interest. The book might even have been shorter without diminishing its value and certainly without diminishing its interest, for with the best will in the world the reader is apt to let his mind wander from the written word: to read this book through is indeed a test of endurance.

The book does not contain any original work but is complete in the sense that the work of others is given in detail—though those of us who watched with such great interest the work of the late Lawrence O'Shaughnessy will be disappointed at the small space devoted to his animal and clinical research.

The format is good and the work adequately illustrated; the index is, however, not of the same standard of thoroughness as the rest of the book.

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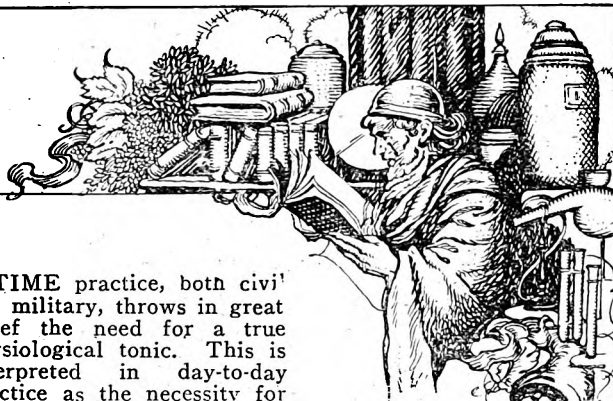
C.N. = Clinical and other Notes.

C.L. = Current Literature.

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JOURNAL

OF THE

ROYAL ARMY MEDICAL CORPS

Corps News.

DECEMBER, 1941.

EXTRACTS FROM THE "LONDON GAZETTE."

Oct. 21.—Col. J. T. Simson, M.B. (1964), (late R.A.M.C.), having attained the age for retirement, retires on ret. pay, Oct 21, 1941, and remains empld.

Lt.-Col. (temp. Col.) J. C. A. Dowse, M.C., M.B. (8626), from R.A.M.C., to be Col. Oct. 21, 1941, with seniority Apr. 15, 1939.

Maj. (temp. Lt.-Col.) A. J. Beveridge, O.B.E., M.C., M.B. (8619), to be Lt.-Col. Oct. 21, 1941.

Oct. 24.—Maj. (Qr.-Mr.) W. C. Prince, O.B.E., M.M. (44229), having attained the age for retirement, is placed on ret. pay, Oct. 23, 1941.

Capt. (Qr.-Mr.) G. P. Steer, M.B.E. (51928), to be Maj. (Qr.-Mr.), Oct. 23, 1941.

Oct. 28.—The undermentioned Capts. (Short Service Officers), are appointed to perm. commns., retaining their present seniority:

Aug. 1, 1941:

(Temp. Maj.) J. F. Wilson, M.B., M.D. (62173).

Oct. 1, 1941:

A. B. Dempsey (66501).

Oct. 23, 1941:

R. S. Hunt (70112).

G. B. Heugh (70114).

(Temp. Maj.) W. Stewart, M.B.E., M.B. (70115).

(Temp. Maj.) E. A. Smyth, M.B. (70120).

(War Subs. Maj.) (Temp. Lt.-Col.) J. A. Davidson, M.B., M.D. (70121).

(Actg. Maj.) C. L. Lewis (58964).

Oct. 24, 1941:

W. N. L. Haynes (44417).

(Temp. Maj.) J. R. Kellett, M.B. (66477).

(Temp. Maj.) K. G. F. Mackenzie, M.B. (66482).

Oct. 27, 1941:

I. N. Fulton (70127).

Temporary Commission.—War Subs. Capt. F. R. How (16569), relinquishes his commn.

on account of ill-health Oct. 29, 1941, retaining the rank of Capt.

Oct. 31.—Maj.-Gen. F. Casement, D.S.O., M.B., K.H.S. (8370) (late R.A.M.C.), retires on ret. pay Oct. 29, 1941, and remains empld.

Col. (actg. Maj.-Gen.) G. Wilson, O.B.E., M.C., M.B. (26291) (late R.A.M.C.), to be Maj.-Gen. Oct. 29, 1941.

Col. A. G. Biggam, O.B.E., M.D., F.R.C.P., K.H.P. (14900) (late R.A.M.C.), to be Maj.-Gen. (supernumerary). Oct. 29, 1941.

Lt.-Col. (temp. Col.) H. B. F. Dixon, M.C., M.D., F.R.C.P. (10659), from R.A.M.C., to be Col. Oct. 29, 1941, with seniority Apr. 28, 1939.

Maj. (temp. Lt.-Col.) D. Fettes, O.B.E., M.B., F.R.C.S. (Edin.) (15746), to be Lt.-Col. Oct. 29, 1941.

Nov. 4.—The KING has been pleased to approve of the undermentioned appt.:

Lt.-Col. (temp. Col.) S. Smith, M.B., F.R.C.P. (14376), R.A.M.C., is apptd. Hon. Physician to The King, Oct. 13, 1941 (vice-Maj.-Gen. R. C. Priest, C.B., M.D., F.R.C.P. (14073), (late R.A.M.C.), who has retired).

Nov. 7.—Maj. A. C. H. Gray, O.B.E., M.B. (10101), (late R.A.M.C.), reverts to ret. pay and resumes the rank of Col. on ceasing to be re-empld. Nov. 8, 1941.

Nov. 11.—Col. K. Comyn, M.D. (4596), (late R.A.M.C.), retires on ret. pay, Nov. 9, 1941, and remains empld.

Lt.-Col. (actg. Brig.) W. C. Hartgill, O.B.E., M.C. (8648), from R.A.M.C., to be Col. Nov. 9, 1941, with seniority from July 1, 1937.

Maj. (temp. Lt.-Col.) T. Menzies, M.B. (8428), to be Lt.-Col. Nov. 9, 1941.

Short Service Commission.—Lt. J. P. Crawford (154902), to be Capt. Nov. 1, 1941.

Nov. 14.—The KING has been pleased to approve of the following appts.:

To be Hon. Surgeons to the King:

Maj.-Gen. G. Wilson C.B.E., M.C., M.B. (26271) (late R.A.M.C.), Oct. 13, 1941 (vice

Journal
of the
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OF THE

Royal Army Medical Corps

EDITED BY

COLONEL S. LYLE CUMMINS, *C.B.*, *C.M.G.*

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July—December, 1941.



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Maj.-Gen. A. D. Fraser, *D.S.O., M.C.*, M.B. (1112) (late R.A.M.C.), retired).

Col. (temp. Brig.) D. T. Richardson, *M.C.*, M.B. (3014) (late R.A.M.C.), Oct. 29, 1941 (vice Maj.-Gen. F. Casement, *D.S.O.*, M.B. (8370) (late R.A.M.C.), retired).

Regular Army Reserve of Officers.

Nov. 7.—Capt. K. L. O'Sullivan (10052), to be Bt. Maj. Aug. 12, 1941, under the provs. of Article 168, Royal Warrant for Pay and Promotion, 1940.

THE ARMY DENTAL CORPS.

Oct. 28.—The undermentioned, having attained the age for retirement, retire on ret. pay:

Lt.-Col. (actg. Col.) J. S. Smith (19379). Oct. 17, 1941.

Maj. C. H. Pywell (10252). Oct. 26, 1941.

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Oct. 31.—The undermentioned Sisters resign their appts.:

Miss M. K. Finch-Noyes. Sept. 8, 1941.

Miss E. M. Leicester.

Sept. 15, 1941.

Miss O. N. Pocock.

Oct. 1, 1941.

Miss G. K. Roberts.

Oct. 31, 1941.

LUNCHEON AT R.A.M.C. HEADQUARTERS MESS.

On Wednesday, November 19, 1941, the Director-General, Army Medical Services, and officers, Royal Army Medical Corps, entertained a distinguished company to an informal luncheon in the R.A.M.C. Headquarters Mess, Millbank. The guests were all in one way or another associated with the war-time activities of the Army Medical Services.

Both Medical and Dental professions were represented.

The guests on arrival were received in the Smoking Room by Lt.-Gen. A. Hood, Director-General, Army Medical Services.

Both before and after luncheon, guests and hosts intermingled and chatted happily together. Old friendships and acquaintances were renewed, while new friendships were formed among those who hitherto were known to each other by name only. The call to work brought an end to a very enjoyable luncheon party.

The guests were as follows:

Dr. F. M. B. Allen, Secretary, Medical War Committee, Northern Ireland.

Dr. G. C. Anderson, Secretary, Central Medical War Committee.

Lt.-Col. J. H. Anderson, A.D.G., A.M.S., Australian Forces in United Kingdom.

Capt. W. M. Anderson, Assistant Naval Attaché, United States Navy Medical Corps.

Sir W. Girling Ball, Chairman of Services Committee of Central Medical War Committee.

Maj.-Gen. H. P. W. Barrow, Colonel Commandant, R.A.M.C.

Maj.-Gen. R. J. Blackham, War Office representative on Medical Priority Committee.

General Sir Ernest W. C. Bradfield, India Office.

Viscount Dawson of Penn, Physician in Ordinary to H.M. The King and to Queen Mary.

Colonel de Cailly, Senior Medical Officer of Free French Forces.

Surgeon Vice-Admiral S. F. Dudley, Medical Director-General, Royal Navy.

Maj.-Gen. H. Ensor, Colonel Commandant, R.A.M.C.

Surg. Capt. E. E. Fletcher, Deputy Director-General for Dental Services, Royal Navy.

Professor F. R. Fraser, Director-General, Emergency Medical Services.

Major Gallemaerts, Senior Medical Officer, Belgian Forces in United Kingdom.

Col. Gergovich, Senior Medical Officer, Polish Forces in United Kingdom.

Major Leslie Haden Guest, Member of Parliament and Member of Parliamentary Medical Committee.

Lt.-Gen. Sir James A. Hartigan, Colonel Commandant, R.A.M.C.

Col. P. R. Hawley, Medical Corps, United States Army.

Lord Horder, Physician in Ordinary to H.M. The King.

Col. S. Langer, Senior Medical Officer, Czechoslovakia Forces in United Kingdom.

Brig. R. M. Luton, Deputy Director of Medical Services, Canadian Forces in United Kingdom.

Sir Edward Mellanby, Secretary, Medical Research Council.

Maj.-Gen. W. H. S. Nickerson, Colonel Commandant, R.A.M.C.

J. B. Parfitt, Esq., President, British Dental Association.

Lt.-Col. G. S. Parkinson, Dean of London School of Tropical Medicine and Hygiene.

Sir Frank Pearce, Past President, British Dental Association.

Professor R. M. F. Picken, Professor of Preventive Medicine, The Welsh National School of Medicine, Cardiff.

Col. A. H. Proctor, Dean, Post-Graduate School, Hammersmith.

W. Rowley-Bristow, Esq., Consultant in Orthopaedic Surgery to the Army at Home.

Dr. A. G. H. Smart, Colonial Office.

Group Capt. L. Somerville-Woodwis, Chief Dental Officer, Air Ministry.

Lt.-Col. W. G. Trelford, Assistant Director of Dental Services, Canadian Military Headquarters.

Sir Alfred Webb-Johnson, President, Royal College of Surgeons.

Air Marshal Sir Harold Whittingham, Director-General, Medical Services, Royal Air Force.

Sir Charles Wilson, President, Royal College of Physicians.

The following were invited but were unable to accept:

Sir Francis Fremantle, M.P., Chairman, Parliamentary Medical Committee.

W. Kelsey Fry, Esq., Consulting Dental Surgeon, Ministry of Health.

Professor J. E. Gordon, Head of the Harvard Medical Unit and Representative American Red Cross.

Sir William Wilson Jameson, Principal Medical Officer, Ministry of Health.

Major Gunner Johnson, Norwegian Senior Medical Officer.

Major B. H. H. Neven Spence, M.P., and Member of Parliamentary Medical Committee.

H. S. Souttar, Esq., Chairman of the Central Medical War Committee.

Professor Sydney Smith, Dean of the Faculty of Medicine, Edinburgh University.

Professor Warrington Yorke, Dean of Liverpool School of Tropical Medicine.

ROYAL ARMY MEDICAL CORPS AND THE ARMY DENTAL CORPS COMFORTS GUILD.

THERE is not much to report since we wrote last month. We are glad to say that our appeal for fresh knitters met with a fairly good response but we still need more.

We were very glad to receive a letter from Gibraltar announcing the safe arrival of our parcel of books and games. We hope that we shall have further news from overseas before long.

May we again appeal for any books, magazines, indoor games and playing cards. It is increasingly difficult to get supplies of

these things and the men are so glad of them. West Africa has asked specially for magazines.

If there are any R.A.M.C. or A.D. Corps Officers' wives living near London who could spare time on Tuesdays to help us pack at the Officers' Headquarters Mess, we should be very glad of their help. Any further information can be obtained from the Honorary Secretary of the Guild.

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ARMY CROSS-COUNTRY RUNNING.

THE London District Cross-Country Championship was held on November 22, when Private Maurice Bingham of The Army Dental Corps won the championship cup.

Bingham, who is the well-known Finchley Harrier, was in great form and scored a very easy victory in a field of 200 runners.

DEATHS.

BRIDGES.—In Cheltenham suddenly after an operation on Oct. 22, 1941. Major Arthur Brodie Hamilton Bridges, O.B.E., R.A.M.C. Born Nov. 2, 1886, he was educated at St. Thomas's Hospital and took the M.R.C.S. and L.R.C.P. London in 1912. Commissioned Lieut., R.A.M.C., from the S.R. Jan. 24, 1913, he was promoted Capt. March 30, 1915. He was Surgeon to the Commander-in-Chief in India from Sept. 14, 1916, till Dec. 4, 1920.

He was appointed Surg. Capt. 1 Life Guards Nov. 1, 1921, returning to the R.A.M.C. April 10, 1923, and was promoted Major Jan. 24, 1925. He retired Jan. 24, 1933. On Sept. 29, 1938, he took up a Retired Pay appointment at the Central London Recruiting Depot, Whitehall. He was recalled to the Active List on Sept. 2, 1939. He served in France from Aug. 1914, to Nov. 1915, and Feb. to Sept. 1916. From, Nov., 1915, till

Feb., 1916, he served in Gallipoli, Macedonia and Egypt. Mentioned in Despatches Jan. 1, 1916, he was awarded the *O.B.E.*, 1914 Star, British War and Victory Medals.

A correspondent writes :

"Bridges was a happy and imperturbable colleague with a very charming manner to everyone. He kept up his remarkable athletic activities and his games at squash were a revelation. He will be very much missed by both partners and opponents alike. Those who had the pleasure of working with him since the beginning of the war can scarcely believe that he is gone and will miss him sadly both as a fine friend and a very loyal brother officer."

DAVIS.—In York on Oct. 26, 1941, Capt. (Q.M.) Fred Davis, R.A.M.C. Born Jan. 10, 1875, Capt. Davis enlisted Feb. 10, 1893, and was commissioned Lieutenant and Quartermaster Feb. 21, 1915. He was promoted Capt. Feb. 21, 1918. He retired June 6, 1923, and on the outbreak of the present war he rejoined on Sept. 2, 1939. He served in South Africa, 1900–1902, being awarded the Queen's Medal with Clasps Cape Colony, Orange Free State and Johannesburg and the King's Medal with two Clasps. He served in France from Aug. 18, 1914, till 1919. Twice mentioned in Despatches he was granted the next higher rate of pay and awarded the 1914 Star, British War and Victory Medals.

WISHART.—On Nov. 8, 1941, at Gairloch, Capt. J. R. Wishart, The Army Dental Corps. Born on April 20, 1904, he was educated at George Heriot's School and the Incorporated Edinburgh Dental Hospital and School and qualified as a dental surgeon in 1927. He was commissioned as a Lieutenant on March 12, 1940, and served in the Scottish Command, being promoted to the rank of Capt. on March 12, 1941. Capt. Wishart, whose death was the result of an accident, was but recently married, and we extend our sincere sympathy to his widow in her tragic bereavement.

CONWAY.—On Nov. 12, 1941, Major Thomas Dowling Conway, R.A.M.C., Retired. Born Feb. 2, 1872, he enlisted Feb. 2, 1886. Commissioned Quartermaster and Hon. Lieut. Sept. 11, 1912, he was promoted Hon. Capt. July 1, 1917, and Major April 1, 1925. He retired Feb. 2, 1927. He served in the Nile Expedition of 1898 and was present at the battle of Khartoum, being awarded the Medal and Egyptian Medal with Clasp, Khartoum. He served in France from Aug., 1914, till the end of the war. Twice mentioned he was granted the next higher rate of pay and awarded the 1914 Star, British War and Victory Medals.

Colonel Ernest Janes, *O.B.E.*, writes :

"It was with deep regret that I heard of the death of Major T. D. Conway, on Nov. 12. I had the good fortune to serve with him at the R.A.M.C. Record Office, Woking, from 1920 to 1922, when he together with Lieut.-Col. Collier and myself were employed there in clearing up the residue of work from the Great War, restoring the Office to normal conditions, under Col. C. R. Evans. He has left on me the impression of a most conscientious officer who took his life and work very seriously and for whom nothing was too much pains. He had many lovable qualities and I have a very happy recollection of the times we spent together. He left the Record Office late in 1922 to proceed to Hong Kong, and whilst there he received his accelerated promotion to Major. He returned to England in 1926, and spent the last year of his service at Netley retiring for age in April, 1927. He called on me from time to time at the War Office and within the last year came to express his willingness to return to service with his old Corps, but he was then obviously ageing. His departure removes one who has left an excellent record of service and it must have been a great comfort to him in his later days to know that he was leaving two sons (Lieuts. John Thomas Conway and William Edward Conway, *M.M.*) in the Corps who were worthily carrying his good name. It came as a great shock to me to know that he was gone."

EDITORIAL NOTICES.

The Editor will be glad to receive original communications upon professional subjects, travel, and personal experiences, etc. All such articles or papers, etc., intended for publication must be submitted **in duplicate** through the proper channels, i.e., Commanding Officer and A.D.M.S., or D.D.M.S., to the Under-Secretary of State, War Office (P.R. (O)), and not to A.M.D.2, otherwise such articles are liable to be returned to the authors and this may cause delay in publication.

Correspondence on matters of interest to the Corps, and articles of a non-scientific character, may be accepted for publication under a nom-de-plume.

All Communications or Articles accepted and published in the "Journal of the Royal Army Medical Corps," will (unless the Author notifies at the time of submission that he reserves the copyright of the Article to himself) become the property of the Library and Journal Committee, who will exercise full copyright powers concerning such Articles. Owing to the acute shortage of paper it is necessary to limit Articles submitted for publication to the least number of pages possible. It is also desirable that the number of illustrations should be reduced.

A free issue of twenty-five reprints, or any lesser number to the extent applied for, will be made to contributors of Original Communications and of twenty-five excerpts, or any lesser number as above, in the case of Lectures, Travels, Clinical and other Notes, and Echoes of the Past. Such free reprints or excerpts will, however, only be sent to those specifying their wish to have them and a request for same should accompany the article when submitted for publication, stating the number of reprints or excerpts required.

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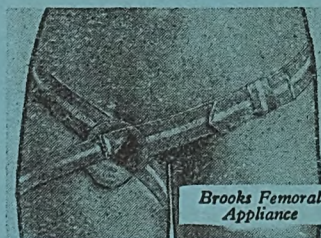
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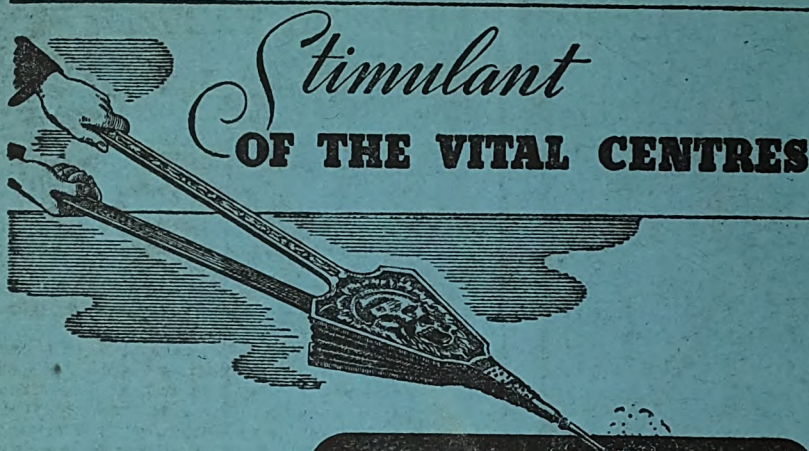
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Lancet, 1934, ii, 780.

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